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THE

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AND OF

THE INSTITUTIONS IN UNION.

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ORDINARY MEETINGS.

Wednesday Evenings at 8 o'clock.

APRIL 12.—Passion Week. No MEETING.

APRIL 19.—"On the Preservation of Natural History Specimens for Museum Purposes." By B. WATERHOUSE HAWKINS, Esq., F.G.S.

CANTOR LECTURES.

There will be No LECTURE on Tuesday evening next.

Proceedings of the Society.

◆

CANTOR LECTURES.

The first lecture of Dr. Crace Calvert's Course was delivered on Tuesday evening, the 4th of April. During the vacation the complete course of lectures, corrected and amplified by the author, will be published in the *Journal.*

EIGHTEENTH ORDINARY MEETING.

Wednesday, April 5, 1865; Edward Holland, Esq., M.P., in the chair.

The following candidates were proposed for election as members of the Society :—

Bourne, Geo. S., R.N., Royal Hospital, Greenwich, S.E.
Brackenbury, Capt. C. B., R.A., 1 Adelaide-place, Woolwich-common, S.E.
Brady, Francis, 12, Limes-villas, Lewisham, S.E.
Brumleu, Charles, 6, St. John's-road, Brixton, S.
Burt, C. J. T., Roadside, West Hill, Putney, S.W.
Clark, Edward, 2, Rose-villas, Montpelier-road, Peckham-rye, S.E.
Cotterill, W., Norbiton-park, Kingston-on-Thames, S.W.
Danby, Thomas, 7, Parliament-street, S.W., and 31, South-grove, Peckham, S.E.
Dolan, H., Park-hill, Clapham, S.
Eden, Frederick Morton, Capel-house, Kew, W.
Farnall, Harry Barrard, Poor Law Board, Whitehall, S.W.
Field, Hamilton. Clapham-park, S.
Folkard, Augustus, Haslam-house, Lewisham, S.E.
Gibson, John, 1, Era-place, Surrey-lane, Battersea, S.W.
Goodwin, Rev. Thomas, M.A., Croom's-hill, Greenwich, S.E.
Gowan, George D'Olier, Wood-lawn, Dulwich, S.E.
Graham, John, 74, Manor-street, Clapham, S.
Harker, George, Uplands, Sydenham, S.E.
Harrison, C. Wrightman, Pneumatic Loom Company, 26, Lombard-street, E.C.
Hawley, Henry J., 4, Foxgrove-road, Beckenham, S.E.
Herapath, John, Catford-bridge, Lewisham, S.E.
Hills, F. C., Denmark-hill, S.
Hoblyn, Thos. Hallam, Rickling, Bishop's Stortford.
Holloway, William, 4, Park-road-villas, Battersea, S.W.
Hosegood, Thomas W., Rosendale-villa, West Dulwich, S.
Jerram, E. J., 3, Cedars-road, Clapham-common, S.
Johnson, John G., Assay-office, 18*a*, Basinghall-st., E.C.
Legg, George, 61, King William-street, E.C.
Lewis, Thos., Somerset-lodge, 35, London-rd., Croydon, S
Lord, W. B., 37, Stockwell-park-road, Brixton, S.
Macandrews, J., Roehampton-lodge, Roehampton, S.W.
McArthur, W., 1, Gwydyr-houses, Brixton-rise, S.
Martley, W., 15, Cedars-road, Clapham-common, S.
Menge, Rev. J. P., Electrical-hall, Park-villas, Lower Norwood, S.
Milnes, William S., 11, Devonshire-road, Greenwich, S.E.
Monk, J. C., 3, Manor-road, Wallington, S.
Moren, George, 38, Threadneedle-street, E.C.
Painter, Henry, 1, Arlington-villas, Loughborough-park, Brixton, S.
Papengouth, Lieut. Oswald C., 12, Bloomsbury-sq., W.C.
Price, Charles J., Carlton-chambers, Regent-street, S.W.
Tefft, Benjamin F., LL.D., 31, Upper King-street, Holborn, W.C.

The following candidates were balloted for and duly elected members of the Society :—

Booth, Captain John, 21, Kensington-crescent, W., and Conservative Club, S.W.
Chatwood, Samuel, Lancashire Safe and Lock Works, Bolton.
Good, Joseph Henry, 21, Upper Hamilton-terrace, N.W.
Mackenzie, James Joseph, Jennings' Hotel, Albemarle-street, W.
Morris, William, Carmarthen.
Scully, George, 4 and 5, Agar-street, and 7, Adam-street Strand, W.C.

The Paper read was—

THE FOOD OF ANIMALS.

BY PROFESSOR JOHN COLEMAN.

The subject which I have undertaken to introduce this evening is one of great importance, not only to those immediately interested, but to the public generally, as an economical method of feeding must influence the price of meat. The tendency of English agriculture is towards an increase of live stock, and therefore anything relating to their management should be interesting. Great progress has been made in the management of fatting animals during the last ten years. Practices have been established, founded on more correct knowledge of physiological principles. Contrast the present system of cooking food—of mixing a variety of substances natural and artificial, and the use of the pulper and chaff-cutter, with the ancient practice of allowing a beast to fill himself with sliced roots and hay *ad libitum*. Still, there is room for improvement. Farmers are too often satisfied to carry on their business as they have learnt it, without testing their practice by reason and science; and shut their ears, as it were, to the valuable advice from time to time advanced by scientific men. The subject is, moreover, peculiarly interesting after such a season as the past, which has been remarkable for the deficiency both of roots and hay—an unusual event—for we have frequently suffered in one or other of these important products; the weather which proved injurious to the one having favoured the other. Both being deficient, our prospects last autumn were gloomy indeed, and now that the trial is partially over, we may congratulate ourselves that we have got through the winter so well. The evil has not been unmixed with good. Necessity, the mother of invention, has led to shifts and plans, in carrying out which important experience has been gained, to bear fruit in a more economical management hereafter. And although I do not anticipate that in ordinary seasons cattle will be fed, as a rule, without roots, I am certain that a smaller proportion will be found sufficient; and, consequently, a considerable saving will be effected in this costly produce. The value of well-made straw as food has been over and over again insisted upon; yet it needed such a season as the last to carry conviction to the sceptical. In future we may hope that more straw and less hay will be cut up; less roots, and more corn and artificial food used. I propose to consider the subject under three heads:—

1. Natural food—such as root crops, hay, and straw.
2. Artificial foods—grain.
3. The best means of using these materials.

The animal body consists of three descriptions of material, skin and flesh, fatty matters, and the bony structure, made up of nitrogenized, non-nitrogenized, and mineral substances, all of which must be supplied in the food. Now Mr. Lawes has found that the ox, the sheep, and the pig are composed of different proportions of these substances, and that the proportions vary in the same animal, according as it is in store or fat condition; that, as the animal becomes ripe, the proportion of nitrogenous, mineral matters, and water is reduced, whilst fat (non-nitrogenous substance) increases largely; thus the ox contains 18 per cent. of nitrogenous material in a store state, and only 15 per cent. when fat; 16 per cent. of non-nitrogenous compounds in the animal is increased to 30 per cent. when fat, whilst mineral matters recede from 5 to 4 per cent., and water from 60 to 51 per cent.

Most vegetables in a ripe state, and when grown under proper conditions, are composed, in differing proportions, of a flesh-forming material, a heat-producing substance, and some mineral matter, required for the bones and juices. A large proportion of all vegetables consists of starchy materials, or digestible fibre, whose use in the animal economy may be likened to the fuel which supports ordinary combustion; it is taken into the blood, and then slowly burned, producing heat, so necessary for the preservation of animal life. The amount of fuel required depends upon the description of animal, and the exposure to or protection from cold. If we have an excess of such material, it is partly accumulated as fat. A great distinction is however to be made between starch, sugar, and digestible fibre, and the vegetable oils, which are almost identical in composition with fat. Mr. Lawes concludes, from his experiments, that starch, cane sugar, and probably digestible fibre, have, weight for weight, nearly equal feeding qualities, whilst fat and oil have probably about 2½ times the value of those materials, for the purposes of respiration or storing up fat in the system.

Root Crops.

The Swede.—According to Dr. Voelcker, the bulb contains about 88 per cent. of water and 12 per cent. of solid matter, consisting, in round numbers, of—

Flesh formers	2 parts
Sugar, gum, starch............	1½ ,,
Vegetable fibre (digestible)	5½ ,,
Mineral matter	3 ,,

The mineral matter is of great importance, containing all those salts required in the tissues and bony system. Thus in the whole plant we find a large proportion of the ash to consist of potash, phosphate, and sulphate of lime, and common salt. It is calculated that a crop of twenty tons of swedes robs the soil of about 500 lbs. of mineral matter, which must be returned to the soil, either by sheep feeding or a direct application of manure. Turnips and hybrid varieties differ from the swede only in containing more water, and therefore less solid matter. It will be seen that the root crop is, for a given bulk, not particularly nutritious; the experience of the past season proves that it may be to a great extent replaced by other materials; and I do not hesitate to state that an unlimited supply of roots is often very injurious. The nutritive qualities of roots depend upon their condition; like all other vegetables, they pass through different stages of growth, and if consumed before being properly matured, or grown on soil that is not properly enriched, they are not only un-nutritious, but frequently prove injurious. Who has not remarked the severe losses in young sheep when first put on swedes in a growing season, and when the plants are in a very fresh state? This is due to the unripe condition of the crop, producing violent disturbance of the digestive system; in fact, just the same result as if we eat unripe fruit.

These unmatured roots are found to be deficient in gum and sugar, and to have an excess of nitrogen. As a proof of the correctness of this view, it may be noticed that the locust bean, a food very rich in sugar, has been found to arrest this dangerous scour. Recent examination has proved that all food in an unripe and unhealthy state contains more nitrogen than when ripe, and now, the proportion of sugar, gum, &c., is a surer test of value. Some very important practical considerations arise from these facts. Root crops should not be consumed until they are fully ripe, and hence it follows that early-planted well-grown turnips will do for animals better, at a certain time, than swedes. Land that is undrained, or supplied with an excess of manure, will not mature its crops; and, lastly, swedes and mangolds will, as a rule, be greatly improved by storing for a few weeks, as the ripening process goes on rapidly in the heap, and there is a considerable increase of sugar and soluble materials. It will be remembered that there was a time, comparatively recent, when our scientific authorities believed that the nutritive value of food was dependent upon the proportion of nitrogen present. Now we know that an excess of nitrogen is a proof of an unhealthy condition, and that whilst a certain portion of flesh-forming material is highly important, it is the proportion of gum, sugar, starch, and digestible fibre that really determines the nutritive qualities. In wet, cloudy seasons, when there is an absence of direct rays of the sun, we must be especially careful how we consume our roots. The eating a large bulk of such raw material, unqualified by sugary or oily food, will prove most prejudicial. For all these reasons I recommend the storing of roots whilst they are in a comparatively growing state; the moderate use of farm-yard and other highly nitrogenous manures to the root-crop, and their complete mixture with the soil, where practicable, instead of the old plan of placing such material immediately beneath, and in close contact with, the crop; and, above all, storing for a few weeks before using. There is, moreover, economy in this latter practice, as regards all crops to be consumed in the winter and spring, for if left exposed in the soil the proportion of woody matter continues to increase at the expense of the starch, &c.

Mangolds are a most valuable root in the southern and drier countries of England, but seem unsuitable for the moister climate of the north. The crop requires heat in order to mature. According to Dr. Vœlcker, the mangold bulb consists of 86·04 water and 13·96 dry matter, which latter is made up of—Flesh-formers, 1·81; heat producers, 11·19; mineral matters, ·96. As a general rule, the mangold is not fit to eat until it has been stored for some months, but this entirely depends upon the soil and the season. On porous, well-cultivated soils, the mangold crop last year was much more suitable for immediate use in November than the swedes, which were growing fast, whereas the mangold, in consequence of the hot, dry summer, had matured its sugar, and in many instances it was eaten on the ground, and the stock did remarkably well. After a wet autumn—on the contrary—the mangold would prove most unwholesome, and would, in all probability cause the animals to scour, and do them harm instead of good. This is generally the case, and as the root possesses excellent keeping properties, I advise storing and not beginning to consume until the end of February or March. So nutritious is a well-kept mangold that I have seen stock sows quite fat from eating this root. The use of salt as a manure for mangolds has been constantly recommended, though I know of no very conclusive experiments. The mangold is derived from a seaside plant, and its ashes contain a considerable proportion of salt, but the indiscriminate use of salt is very dangerous; on all strong soils it will do harm, as it retards growth, whereas on warm, quick sands and gravels, by checking growth, salt does good, as there is a tendency under such conditions to return to the original annual state, and we see many of the plants running to seed. Salt will probably check this, and four to five cwt. per acre sown broadcast will be likely to do good. No stock farmer should be without a few acres of mangolds, to be kept in reserve against a backward spring; they are then invaluable and are never in the way, for if we have abundance of grass, &c., a few cut up will make an agreeable change.

In our short notice we must not omit the *cabbage*, which on all rather strong, well-cultivated soils, is a most valuable crop. According to Dr. Voelcker, we have much less water in the outer leaves than in the inner leaves and heart; thus he found in outer leaves only 84 per cent., whilst the heart and under leaves contained 89 per cent.; the average proportion of gum sugar is about 7 per cent., and rather less than 1 per cent. of ash. The cabbage is found useful for all kinds of stock, and, whether for the production of milk or fat, is a valuable food. It is expensive to grow, and requires plenty of manure, but coming in during the summer and early autumn is of great use, as we are then often short of, or at any rate, want a change of food. It may also be grown as a winter crop, and stands frost well.

Rape is a crop that on peculiar soils—such as the peaty soils of Lincolnshire, the marls, and strong soils generally that contain lime—does well and affords much valuable keep. The soil should be well tilled and in a highly enriched condition—the climate rather moist and warm. From the large amount of nitrogen compounds and starchy matters (11½ per cent.) that the rape contains, we can readily understand that the nutritive qualities of the crop greatly depend upon favourable conditions, and such is the case. In a wet, cold season, or if eaten off at a wet time and whilst in a very growing state, rape proves unhealthy food, causing scour; and I should recommend that sheep be gradually introduced to this succulent crop, and never allowed to consume it without a good supply of dry food to act as a corrective.

Grass and Hay must not be omitted from our notice, as forming so considerable a portion of all natural produce. Hay made from good sweet land, consisting of a variety of grasses, is the best possible food we can use; and more milk, and possibly as much beef, will be made from an unlimited supply of good hay and water as by any other mode of feeding. But we cannot afford to use hay in this way; we must keep an increased stock, and we find that hay is often a very expensive food, inasmuch as laying up the land for it curtails the summer stock, and frequent mowing weakens the land. The feeding value of grass depends in a great degree upon the presence in the soil of those mineral substances which the better grasses require; a variety of different grasses and leguminous plants are then encouraged, which, from their various qualities, form a mixture highly suitable to the digestive process, and also are of regular and slow growth. I do not doubt that an examination of our best grazing land would exhibit a great variety of grasses, and I am quite certain that very rapid growth is undesirable. This, to some extent, is the reason why water meadows and sewage grass are comparatively so weak. The grass is forced too rapidly to become properly matured, and the excessive rankness of certain descriptions which rejoice in an excess of moisture, keeps in check other kinds of grasses, and hence the produce is more simple than that of natural upland grass. These facts, whilst they may not, under certain circumstances, militate against water meadows or sewage, point out that whilst animals are on such food, we should do well to supply artificial matters containing sugar or oily materials, to counteract the excessive quantity of nitrogen which such food invariably contains. Mr. Lawes' experiments at Rugby lead him to the same conclusion. One of the oxen fed there was considerably lighter after having his fill of sewage grass for many weeks, and all the animals did badly. But when 4 lbs. a day of linseed cake was added to the grass, the improvement was visible and satisfactory. Sewage grass is better adapted for milk cows than for any other descriptions of stock, but even with them it will not do well alone: it is too watery. I have seen ewes and lambs on the water meadows in early spring doing very badly with abundance of grass, especially if the weather has favoured a rank growth; and I cannot condemn too strongly the practice of thus feeding sheep without some dry and nutritious food. Undrained land, again, favours the growth of coarse watery grasses, which seldom can be properly matured. Hence the pasturage is always inferior, although the actual bulk of produce may in some instances be found to exceed that from the same land when drained. In most cases where rot in sheep, splenic apoplexy in cattle, and other diseases of the liver and digestive systems occur, the grass will be found unmatured, and containing an excess of nitrogen.

Well-made hay from good dry pastures is without question very valuable food, and food that I strongly recommend, provided it is not too costly, which at the present day, with our resources, we believe it frequently proves. According to Dr. Voelcker, good meadow hay contains more oil, fatty matters, and sugar, but less flesh-forming materials than that from artificial grasses, and both are superior to straw. Hence the value of a portion of hay for young growing animals. But with the aid of artificial food, straw may be largely substituted for hay, both for feeding and growing stock. And this is one of the great improvements of feeding in modern times, well deserving of most serious attention. The nutritive value of straw depends upon the condition and nature of the soil and climate. Some land will produce much more nutritive straw than other land, depending upon the process of harvesting adopted and upon the description of straw, the last stages of ripening, or, more correctly, of over-ripening, consisting in the change of soluble to insoluble matters. You will see, by examining the table, that the total amounts of different ingredients do not differ materially between the fairly ripe and the over-ripe straw, but the condition in which the ingredients exist is widely different.

COMPOSITION OF OAT STRAW, AND HAY.

	Oat Straw cut green.	Oat Straw fairly ripe.	Oat Straw over ripe.	Clover Hay.	Meadow Hay.
Water	16·00	16·00	16·0	20·50	16·66
Oil	1·57	1·05	1·25	3·59	5·01
*Soluble protein compounds	5·51	2·62	1·29	5·00	1·81
†Insoluble do.	2·98	1·46	2·36	8·75	6·25
Sugar, gum, and extractive matters	16·04	10·57	3·19	13·07	15·98
Digestible fibre	26·34	30 17	27·75	16·42	28·88
Indigestible woody fibre	24·86	31·78	41·82	25·62	17·64
Soluble mineral matters	5·76	3·64	2·26	4.43	4·37
Insoluble mineral matters	·94	2·71	4·08	2·62	3·40
	100·00	100·00	100·00	100·00	100·00
*Contain nitrogen	·88	·40	·20	·80	·29
† Do. do.	·47	·23	·36	1·40	1·00
Total	1·35	·63	·56	2·20	1·29

10 per cent. of sugar has become reduced to 3, and other changes have taken place, principally in the proportion of soluble and insoluble woody fibre. It may be asked naturally, whether, by cutting our crops before they become fully ripe, the grain does not lose weight or bulk. I answer not, if cut at the proper time, which practical experience can alone decide. Wheat and oats are now cut in a much greener state than formerly, and it is found that the sample is brighter, contains less bran, and is quite as bulky, considering that there is little or no loss from shedding, and in the case of a wet season, greater power to resist the action of moisture. From the table, it is clear that the very green sample, cut some twenty days before the period of dead ripeness, contains matters that should have gone into the grain. About ten days to a fortnight before dead ripeness is the best time to cut oats, when some of the bell has turned yellow, and the straw is partly turning. I have cut white oats so green, that when lying in swarth, they looked almost like grass, and I feared the sample would contain green corn, but it turned out a beautiful bright colour, weighing 45 lbs. per bushel. It is evident that, in the case of oats more especially, the grain feeds from the straw after it is cut. The materials remain in a soluble condition, and the straw is doubled in feeding value. The difference in value of different kinds of straw is so considerable as often to influence our choice of crops.

Pea and bean straws are both valuable, especially the former, which, when cut moderately green and harvested without wet, is often equal to poor hay, and will be eaten with great avidity by all kinds of stock. Beans contain more woody matter and require to be more fully ripe, therefore are less nutritious; still, the upper portions and the pods form excellent food, and I have seen ewes, especially during severe weather, kept in capital condition with bean straw and a minimum quantity of turnips. Oats come next in value, and every handful of such straw, when sweet, should be passed through the animal's body. The waste that we too often see from the straw being left unthatched is deplorable: the first rain soaks in and damages a large quantity of valuable food. It should be taken as much care of as hay. Barley straw is mechanically suitable for food, and does well to mix with harder materials; but, being generally cut dead-ripe, there is but little soluble matter, and I consider it as the least valuable of our straws. Wheat straw has been much used during the past season, and when cut green and mixed with oat straw it makes good chaff. Still, it is too harsh to be used in large quantities; we should expect irritation of the mucous membrane from too much of such dry material. One great point gained by the use of straw in place of hay is the increase of spring and summer food—both on the pasture land and artificial grasses—and this is most important, as it enables us to keep a heavier stock during the summer, a great difficulty on many light-land farms. In Lincolnshire, so justly celebrated for its farming, they hardly make any hay at all, the seeds being folded off by ewes and lambs. The use of straw, chaff, and pulped roots, in place of long hay and sliced turnips, is one of the great improvements in modern agriculture.

Having thus briefly alluded to the natural produce, more especially grown for stock food, we pass on to consider the various materials extraneous to the farm, which are now brought within reach of the farmer. Whilst our corn produce keeps at the present low rates, it is decidedly a good economy to pass a considerable portion through the animal's body—make our produce walk to market, as the saying is. At the same time, in order to feed economically, we must add to such food other materials, because they contain ingredients which are of great use in feeding, and which our own grain is deficient in, and, moreover, experience has proved that a mixture of different materials is highly desirable.

Linseed Oil Cake has been employed to a far larger extent than any other artificial food, and has risen greatly in value; nor is this the only difficulty. The ignorance as to what a really pure cake should contain, the absence of all analytical tests, and the stimulus of keen competition, has led to the sale of vast quantities of rubbish, containing, with some linseed, a mixture of all sorts of weeds, some actually injurious, and all inferior in feeding qualities. Attention has been lately called to this subject. The farmer has been told, in the clearest language, what a good cake should contain, and by a payment of five shillings any member of the Royal Agricultural Society, if he fears his own judgment, can obtain an opinion as to the genuineness of the article. Many avail themselves of this privilege, but it must be confessed that there are difficulties in the way of obtaining a pure cake, for which the crushers are not altogether responsible. The seed seldom comes clean, and if the 10 to 15 per cent. of dirt and weeds is screened, the crusher must have an extra price for his cake, and this the farmer will seldom give; he is too fond of a cheap article, and looks at the saving of £1 to 30s. a ton, rather than to the actual value of the two samples. The manufacturers must supply the demand; they cannot control it, and if they find that for every ton of pure cake they can sell ten of ordinary kind, they will naturally make that article which pays them best. Many attempts have been made by crushers to supply a perfectly pure cake, but on the whole such attempts have not met with the encouragment they deserve. When seed is dear, a variety of foreign matters are introduced, in order that a cheap cake may be produced. Thus, ground earth nuts, palm nut kernel cake, from Hamburgh, &c., have been introduced into Hull and other places. The difficulty of getting a really good cake has induced a company of farmers in Yorkshire to start a mill, and make their own cake from good screened seed. But it has not hitherto been found a very profitable arrangement. Good linseed cake, made from East Indian seed, should exhibit a red seed, and, upon analysis, should yield from 10 to 13 per cent. of oil, 28 per cent. of flesh-forming constituents, and not more than about 15 per cent. of insoluble woody fibre, with about 6 per cent. of mineral matters; the latter particularly rich in potash and phosphoric acid, which partly explains the high value of manure from animals eating oil cake. Foreign cake, especially such as was imported from New York before the war broke out, was preferred by many as being drier and freer from impurities; latterly, however, the samples have not been so good, whilst French and German oil cakes vary greatly, and are not, on the whole, to be depended upon. Linseed cake is an exceedingly valuable material, being readily eaten by all descriptions of stock, and containing in good proportion the flesh-forming, the heat and fat-producing, and the bony food. The oil is not of the most fattening nature; indeed, in excess, its action is purgative, but when diluted with an equal quantity of meal from grain, this is not felt to be an objection; indeed, it may be perhaps advantageous, as it ensures a healthy condition of the bowels. The large proportion of flesh-forming matters renders linseed cake particularly suitable for young growing cattle. It is, however, a very costly article at the present time, and I think we may lay down a very general rule that whenever good linseed cake exceeds about £9 a ton we must consider how far we can find cheaper materials to take its place. Fortunately, linseed is not our only source of feeding vegetable oil. Of late years, large quantities of other materials, such as rape, cotton seed, and palm nut kernels, have been introduced, and have, in many instances, successfully taken the place of linseed cake.

Cotton seed cake has been and is used to a large extent. Before the American war New Orleans supplied us with a considerable amount, in a decorticated state, that is, free from the greater portion of its hard, indigestible shell. In this state cotton cake was a very valuable article, nearly, if not quite, equal to linseed cake. Now, the quality is very various, and the best contains so large a proportion of woody fibre, that I do not consider it so desirable as many other kinds of food. In selecting cotton cake, choose that which is finely ground, and yellow in colour; this is less indigestible than the black, coarse-ground cakes which we frequently meet with. Several instances of death from the use of bad cake might be quoted. The indigestible shell accumulates in the third stomach, causing inflammation. I think cotton cake unsuitable for young animals, both on account of the shell and the portions of cotton which are frequently found in it. The analysis of three samples, by Dr. Voelcker, gives an average of—

Moisture	11·34
Oil	6·18
Flesh-formers	23·72
Gum, sugar, &c.	30·98
Woody fibre	21·24
Mineral matter	6·54
	100·00

The large amount of ash, which, like linseed, is rich in potash and phosphoric acid, points out cotton cake as likely to influence the value of the manure, as we find that Mr. Lawes, in his theoretical comparison, places it at the head of the list. Samples of cotton cake, with from 25 to 40 per cent. of woody fibre, are occasionally met with. Such food must be highly indigestible. Fine grinding is a point of great importance. A good sample is now worth £5 10s, to £5 15s. a ton, and at such a price will be found economical for growing stock, not too young.

Rape Cake when pure is a valuable food, and deserves a more extensive use. English cake, made principally from East Indian seed, is inferior to German cake, since the cultivation is not so clean, and the seed is adulterated with wild mustard, charlock seed, &c., and, as all these seeds are of the same shape, it is impossible to separate them. Instances have occurred of animals having been poisoned in consequence of the large admixture of wild mustard, which acts as a violent irritant on the mucous coat of the stomach, producing inflammation. I do not mean to infer that good rape cake is not made in England, because clean seed is obtained from the Continent; but, as a rule, the green German rape cake is very superior, and commands usually £1 a ton more than English. The principal objection to rape cake is that its strong, pungent flavour is objected to by cattle, and patience and time are required in order to bring animals to take to it. New cake especially should be avoided, as it loses some of its pungency by age. Some recommend boiling or steaming the rape, for an hour, which destroys the oil of mustard, should any exist, and renders even good cake more mild and palatable. I have known it thus treated and poured over chaff with success. Such a mixture would do well for straw yard cattle. The following anecdote shows how completely animals are, like ourselves, creatures of habit:—Some years since I was feeding two home-bred steers upon linseed cake and meal. In early life, and, indeed, until the fattening process commenced, they had received a small quantity of rape cake, which was replaced by oil cake, as they had become fat. The cowman one day gave them a piece of rape cake, and finding it eagerly consumed, introduced a little, and to his surprise found that they liked it decidedly better than the linseed, and accordingly they were finished off on rape cake. Their tastes had been cultivated to prefer the bitter, hot rape cake to the mild, pleasant linseed cake. So if we begin with young animals, we shall soon teach them to eat it. The best green German rape is worth £6 10s. to £7 a ton. Alderman Mechi is a most consistent advocate of rape, using, I believe, English cake; he believes it to be equally as feeding as linseed cake, at a greatly reduced price.

Palm Nut Kernel Meal.

This comparatively new feeding material is produced from the palm nut kernels, which are ground up, and a portion of the oil expressed; formerly this kernel, which is encased in a hard shell, was thrown away as valueless, the orange coloured flesh of the palm fruit being the portion from which alone the crude palm oil was obtained. It is now some five years since Messrs. A. M. Smith and Co., of Liverpool, were induced to try a few tons of kernels. The hard shell is removed by natives in Africa, who break it off with a hammer. The kernels vary in size from a hazel to a filbert. After being reduced to powder, they were treated very much the same as linseed; a valuable oil results, and the meal which remains still contains, according to quality, from 20 to 25 per cent. of a beautiful fatty matter. At first it was found difficult to find a market for the meal, and it is on record that some of the first made was thrown away. It was soon found that pigs grew fat on it, and a sample reached Dr. Vœlcker, who found it contained materials that should make it a very valuable feeding substance; subsequent experience has fully confirmed the accuracy of this view.

Until the spring of last year the supply of kernels was too irregular to allow of a fair trial being made or the meal becoming generally known. Several farmers, however, used it with success. I myself was the first to try it, and, after a little trouble in accustoming the stock to eat it, found it so valuable that upwards of 30 tons were used in a little over two years. Last year arrangements were entered into to secure an abundant supply of kernels. The matter was then brought before the public, and so active has been the demand that Messrs. Smith have had as much as they could do to supply orders. Palm-nut meal is a gritty meal, of a brownish-white colour, with black specks, which are portions of the skin of the nut. The fatty matter may be seen by rubbing a portion between the fingers, and is evident to the taste, it having rather a nutty flavour. Besides containing from 20 to 25 per cent. of a very feeding oil, we have 15 per cent. of flesh-forming material—about equal to good barley meal—only 15 per cent. of woody fibre, and a considerable amount of ash. Altogether, then, analysis indicates a most valuable substance, which, when mixed with other materials, will prove an economical food, and this view has been fully confirmed by practical experience. It has been tried for cattle, sheep, and pigs. The effect on milk is remarkable, increasing the quantity and especially the richness of the produce without affecting the flavour of the butter. The dairymen in Leicestershire have used it very largely, and found it of the greatest service during last winter to help out the natural produce. For sheep it has also been successfully used. Indeed, it is useful for any stock, whether growing or fattening, provided we mix with it other food. The only point requiring care is in getting stock to take it. Animals that are in high condition and have been accustomed to oil cake do not take to it so readily as poor stock, but a little patience and perseverance will soon overcome this difficulty, and when once accustomed they will eat it readily. Mr. Clarke, steward to Mr. Edward Holland, M.P., tells me that his short-horn heifers, which received the best oil cake through the summer, have done quite as well upon the same weight of palm-nut meal, and when we compare the prices of the two, £6 a ton for nut meal, and £11 to £12 for linseed cake, we can understand the value of this new feeding material. Messrs. A. M. Smith and Co., of Kent-street, Liverpool, are the only English makers. Palm-nut kernel cake and meal from Hamburg is an inferior article, since the oil is extracted by a different process, dissolved out, I believe, and a smaller per-centage, about half, remains in the cake. It is a harsh, dry material, very different in appearance and taste from the English meal.

The following table shows the composition of both :—

	English Palm Nut Meal.	Hamburg Cake.	Hamburg Meal.
Moisture	7·21	12·91	10·84
Fatty matters	22·79	9·48	12·49
*Albuminous compounds ...	15·56	18·25	14·06
Mucilage, gum, and digestible fibre............	36·24	39·16	43·56
Woody fibre (cellulose) ...	14·90	16·90	15·32
Mineral matters	3·30	3·30	3·73
	100·00	100·00	100·00
*Containing nitrogen.........	2·49	2·87	2·25

I look upon palm-nut meal as the best substitute for linseed cake that has yet been offered to the public. Its large amount of ready-made fat supplies a most valuable material, of which our home-grown foods are all deficient. Its reasonable price renders it a decidedly cheap food, that will compare favourably with grain, even at its present low price; and, from an extensive experience, I recommend it to the agricultural public as a valuable feeding material.

The question of employing Indian-corn, lentils, &c., depends upon the comparative cost of such articles and barley, beans, and peas. At present prices it hardly answers to sell our own produce and purchase such food, as the difference in price, according to quality, is not enough to cover expenses of taking to market. Indeed, during this last winter, a considerable quantity of the coarser descriptions of wheat have been ground up, mixed with some fat-producing food, and used with good results as cattle food.

Locust Beans, which contain over 50 per cent. of sugar, have been from time to time advocated, but save as an ingredient of the various cattle foods, which are extensively advertised, they have not come into general use. The importation is limited. Ground into meal, the use of from 10 to 15 per cent. is to be recommended, as it gives a relish, and makes the animals eat less palatable food. The same amount of malt would possibly do as well.

Malt.—Mr. Lawes' experiments have shown that there is no advantage in using malt in place of barley, or, indeed, in mixing the two. A considerable loss occurs in the process of malting, besides the cost of the operation. On the other hand, we know that many of our most successful feeders have been in the habit of adding a small portion of malt to their other food, when they desire to feed an animal to an extreme point; and I think it is a question that is worth careful investigation as to whether the addition of a small quantity of meal would or would not prove advantageous. Judging from the use of locust-beans, which, when given largely, destroy the animal's appetite, I should have concluded, independently of Mr. Lawes' experiments, that malt would not do if supplied in any quantity; too much sugar is objectionable.

A word as to *Cattle Condiments.*—If animals are out of health and require a tonic to stimulate digestion, then the addition to the ordinary food of some substance like fenugreek, aniseed, or caraways, in a small proportion, will be found useful, creating an appetite. If, again, we are fattening an animal to an extraordinary degree, we may use stimulants to induce an appetite, but to suppose that young healthy animals, or ordinarily fed stock, require such materials, is a mistake. By using such things we shall decidedly destroy or injure the digestive system; and to pay from £25 to £40 a ton for the so-called cattle foods is most unprofitable. I might quote the opinions of Mr. Lawes and Professor Simmonds on this point, with which I thoroughly concur. Whilst fully allowing that several of the ingredients possess medicinal properties, Professor Simmonds states that the same objects may be attained by the farmer who mixes well-ground linseed meal with pea and bean meal, adding a small quantity of salt (and, I should say, locust bean meal), with a simple stomachic, nothing being cheaper than fenugreek mixed with aniseed. Such a compound need not cost more than 15s. to 16s. per cwt. If, however, I cannot advocate the so-called cattle condiments, but, on the other hand, consider them most extravagant, and often quite unnecessary, I greatly approve the mechanical condition in which these meals are prepared, and would recommend that now grinding mills are so improved, farmers should endeavour to prepare their food more carefully, and combine together a variety of materials; this leads me to the last portion of our subject, viz.:—

The Different Methods of Feeding.

The digestive apparatus of the ox, sheep, and pig differ materially, and a study of this difference teaches us some general truths as to the description of food suitable for each. The ox possesses a larger proportion of digestive apparatus for a given live weight than any animal; the sheep comes next, the pig the least. Thus the ox, with his large and complicated stomach, and comparatively small intestines, evidently requires a bulky food, containing a considerable portion of indigestible fibre. The stomach must be filled, and therefore the food, to be of use, must be bulky. For every 100lbs. of live weight the ox has 11½lbs. of stomach, and only 2½lbs. of intestines. The sheep has much less stomach and more intestines, and altogether a smaller per centage of digestive apparatus, indicating that whilst the sheep may and should consume some portion of woody matter, its food should contain a large proportion of starch and allied digestible matter—substances that are rendered soluble by the secretions of the intestines. The pig has only 1⅓lb. of stomach and 6lbs. of intestines to each 100lbs. of live weight—showing what we know by experience to be a fact, that this animal requires a concentrated and highly nutritious food, and would starve upon what would be a generous diet for the ox. The great proportion of intestine shows the necessity of a starchy kind of food. These are important points as indicating the descriptions of food that these three classes of animals will require. Thus, for instance, bullocks have been fattened entirely on good straw and oil cakes. Such a food would not do for sheep, as they require in addition a considerable portion of vegetables rich in starch, whilst pigs flourish best when fed entirely on meal.

It might have been supposed that on a subject so important, repeated experiments would have been carried out, and a formula arrived at, so that the process of feeding young, growing, and fattening animals, whether cattle, sheep, or pigs, would be as well defined and understood as any other manufacturing business. But an agricultural experiment, especially upon live stock, is very difficult to carry out, and we are liable to be misled by results. We find that several well worked out experiments, as those of the Duke of Bedford, Messrs. Lawes and Gilbert, &c., have been made, but the object has been rather to determine the merits of different animals than to test the kinds of food. It is, therefore, with considerable hesitation that I venture to submit for your consideration the following mixture of food as likely to prove economical.

For animals growing and fattening at the same time (this will apply to the animal when weaned till killed), the amount of such food depending upon age:—

Linseed cake, or cotton cake	2lbs.
Barley, or wheat meal, or palm-nut meal, or a mixture of all three..................	4 „
Beans or peas, or mixture	2 „
Locust beans or malt	1 „

In the above mixture we get a good proportion of the flesh-forming and fat-forming food. We might, in the later stages of feeding, increase the quantities of the linseed cake, and reduce or do away with the beans.

For sheep a mixture of the fat-producing food—such as linseed cake or palm-nut meal—with peas and oats crushed, in equal proportions, would make a good mixture easy to be used; whilst for pigs a mixture of barley meal, Indian corn if cheap, palm nut meal, and beans, peas, or lentils may be used. Suppose we give barley one-third, Indian corn and palm nut meal, in equal quantities, one-third, and beans, &c., one-third.

A great point in feeding is not to give a larger amount of artificial food than the animal can assimilate. Frequently we find excessive quantities of cake and corn supplied, much of which must be wasted, or, at any rate, pass through the animal. Besides this, animals so over-fed are liable to inflammatory attacks, and, moreover, cramming, especially at an early stage, destroys the digestive powers. A great distinction, then, must be drawn between the supply of generous food suitable for developing the frame and growing bone, flesh, and fat in proper proportions, and the wasteful practice of stuffing an animal under a sort of idea that there cannot be too much of a good thing. Thus calves, during their first year, will not require daily more than from 1 to 2 lbs. of the first named mixture; from the first to the second year from 2 to 3 lbs.; and to be finished up with say 4 to 5 lbs., for we ought to have our animal, which has been growing and fattening ever since it saw the light, fit for the butcher at about 2½ years old. The practice of fattening old oxen is not nearly so common as formerly, still we may now and then have an opportunity of seeing how much food such animals will consume. If we begin when the animal is poor, we must supply bulk rather than quality, as there is a large vacuum to fill up; therefore to begin fattening a large beast with 8 or 10 lbs. of oil cake a-day is a radical error. I should say 6 lbs. of the mixture I have suggested, or of equal portions of cake and meal, would be enough for the first month; each succeeding month we may increase the artificial food from 1 to 2 lbs. a day. In no instance, and under no circumstances, do I believe it is right to use more than 6 to 7 lbs. of a rich, fat-producing food, whether that food be linseed oil cake or any similar material.

In the case of sheep, we may begin artificial food as soon as the lamb can eat. At about a month old a mixture of fine dust oil cake, bran, crushed oats, and finely bruised peas, may be used with good effect. The quantity consumed at this time is very small, but the animal learns how to eat, and when thrown upon its own resources, after weaning, runs to the corn trough and feeds freely through the summer; and until the lamb goes on turnips, ¼ lb. a day of artificial food is ample, ½ lb. from this time until Christmas, then ¾lb., and possibly, during the last month or two of feeding, we may give as much as 1 lb. a head daily. Stock lambs—those intended for breeding—should be fed like the others during summer, and will generally do very well on a fair quantity of roots and dry food, without other helps, during the winter. With regard to pigs, it is more difficult to lay down any rules. The pig should have about as much as he can eat. There is one peculiarity in the habits of the pig that should be noticed—they are sure to do best on sour food; thus an old authority tells us—"The most profitable mode of converting any kind of corn into food for swine, consists in grinding it into meal, and mixing the latter with water, in cisterns, in the proportion of 5 bushels of meal to 100 gallons of water; this must be well stirred several times in the day for a fortnight, during warm weather, or for three weeks in a colder season; at the expiration of which time it will have fermented and become acid. In this state, and not before, the wash is ready for use; it ought to be stirred every time before feeding, and it will be necessary to keep two or three cisterns fermenting in succession, in order to prevent it being used before it is duly prepared. The difference of profit between feeding in this manner and giving the grain whole, or only ground," adds Mr. Young, whose words I quote, "is so great, that whoever tries it once will not be induced to change it for the common methods." I have never tried this method of feeding myself, but believe it is founded on experience and reason. The pig is the scavenger of a farm, and we know that when in a store state much of his food is in a state of fermentation. However, many may prefer a more modern system, namely, that of mixing the meal with boiling water, by which the insoluble cells that contain the gum and sugar of the grain are burst and the food is improved in quality. Cooking will answer for the pig better than for ruminants; indeed, I do not approve of cooking food for cattle or sheep. We may, in some instances, do well to prepare a soup of boiled cake, meal, &c., and pour it over dry chaff, or what is better, we may use our waste steam to pass through a mixture of chaff, pulped roots, and the artificial food we are using. Such a process must, however, be carried on every day, as beasts do not relish such food when it becomes stale. The mixture of chaff and pulped roots, in properly constructed bins, leads to a gentle fermentation, which adds to the value of the food; and such a mixture will keep good for at least 24 hours, so we may prepare one day's food in advance. This is, I believe, the best and the most economical plan that can be adopted. The quantity of roots will depend upon a variety of circumstances, which time will not allow me to discuss. To show the change in our practice, I may mention that a large bullock formerly ate 1½ to 2 cwts. of swedes per diem. Now, a better result is obtained by using three quarters of a cwt. pulped, with a mixture of hay, straw, and chaff; and, in many instances, animals are well fed upon 56 or 60 lbs. a day. Sheep still eat according to their live weight an immense weight of roots—in many instances as much as 20 lbs. a day. Now, this is not a perfect plan of feeding, and I believe the time is not far distant when a great change will take place, and sheep will be treated to pulped roots and chaff just as cattle are, only with a smaller proportion of straw and more roots. In this way an increased quantity of sheep will be kept in a healthier and, at any rate, in a more economical manner.

Gentlemen, I have done, and have only to thank you for the kind attention with which you have listened to my remarks.

DISCUSSION.

The Chairman said the paper they had just heard was remarkable for the amount of practical information it contained. Professor Coleman had scarcely given an opinion without stating the reasons on which that opinion was based, and those were founded on practical experience. He agreed thoroughly, as far as his own experience went, in a large amount of what had been stated in the paper, but more particularly he agreed in this—that it was often the case that while a food by itself was of little value, that same food, if mixed with other ingredients, became invaluable. The great point was to get the proper proportions of nourishing and bulky matter to suit the animal they were feeding. But with cattle this was too often forgotten—that only a certain portion of nourishment could enter into the system; and, therefore, unnecessary expense was incurred by giving an excess of food. An animal with so many stomachs as a ruminating animal possessed, must, as Professor Coleman had remarked, have a large bulk of food, so as to enable the work of digestion to be performed in the ruminating system. That bulk need not of necessity be entirely of expensive food, but, at the same time, if the inexpensive food, such as chaff, were previously prepared by being made more or less succulent, it was rendered more suitable to the natural requirements of the animal. In this way he thought the application of steam for the softening of chaff, whether hay or straw, was of very great value. On his own farm the chaff was cut in a loft, whence it was discharged into a vessel of iron, about twelve feet square, and thickly perforated with small holes at the bottom. In the next building but one was a steam-engine, the waste steam from which was brought by a pipe underneath the perforated bottom of the vessel, so that there was thus sufficient heat to cook that vessel full of potatoes, if potatoes were the food employed. The steam cooked the chaff most perfectly, and when it was thus brought into a succulent state, it was then in a condition to be mixed with advantage with the more nourishing qualities of food which they chose to give the animal, and he found in that way there was great economy in feeding. It was only a few days ago he calculated the expense he was at in connection with a set of feeding boxes appropriated to fifteen head of cattle, when he found that at a cost of 11s. per head per week, they made on an average three pounds weight each per day, and it was only matter of further calculation to ascertain whether that was profitable feeding. He believed Professor Coleman to be correct in almost every respect, but more particularly he thought he was right in his remarks upon sheep feeding, and that it was useless to try to feed sheep with the same description of food as was suitable for the ox or the cow. He had fallen into that mistake himself, inasmuch as in hard winters he had attempted to make large quantities of artificial food, and he found, when chaff formed a large ingredient of that food for sheep as well as oxen, invariably the chaff was not eaten by the sheep, showing that it was not a suitable food for those animals. The late severe winter had been a very trying one in respect of feeding cattle. He (the chairman) lived in a cider country, and it occurred to him that the large quantities of apple pulp which were produced might be made available as an ingredient of food for his cattle. On mixing this with chaff and meal, to his great delight he found the cattle exhibited a great relish for it, which led him to manufacture cider to a very large extent, merely for the sake of the pulp with which to feed the cattle, and the result proved not only beneficial to the animals, but very economical. He had been told by his friend, Dr. Voelcker, that in Germany apples were largely used in feeding cows, and if that were the case, it confirmed the results of his own experience. In conclusion he would say, as far as he understood the subject, the paper with which they had been favoured was eminently a practical one, and could not fail to be serviceable to all who read it.

Mr. G. F. Wilson, F.R.S., said there was one kind of food on which Professor Coleman had laid considerable stress, viz., the palm-nut kernel. Having had much to do with palm nuts, he might state that the supply of them in Africa was enormous; and inasmuch as the value of the oil expressed from those nuts in this country was so much higher than that of the dull-brown, burnt oil as expressed in Africa, he thought, with the price obtained for the cake, it must be a good paying process. He recollected some years ago, when pleuro-pneumonia was prevalent amongst cattle, Mr. Horsfall, of Ottley, used cocoa nut oil as a remedy, with very successful results. Now the oil of the palm nut happened to be identical with that of the larger palm nut, the cocoa-nut; and it might be a question with agriculturists whether an oil similar to that which was found useful as a remedy in the case mentioned, might not also serve as a preventive of disease.

Dr. Voelcker was glad to find that Professor Coleman had laid stress upon the condition of the food when given to the animal, as this was a matter too frequently neglected by those who gave opinions on the qualities of foods. They were too much in the habit of comparing merely the composition of one food with that of another, from which different conclusions were often arrived at as to the practical effect they were likely to produce when given to cattle. He thought this was a great mistake, for they knew by experience, that at one time the mangold was more nutritious than the turnip, and at another time it was the reverse. It was in this case entirely a question of maturity, for the same amount of woody fibre in a properly matured root was very nutritious, whilst in the unripe state of the root it was not so, and in the over-ripe state it was absolutely injurious; therefore the condition of the food materially influenced its nutritive value. Then there was another condition of food, viz., that which arose from keeping it in damp, unventilated places. He more particularly alluded to corn and concentrated food, such as oil cake, peas, beans, and lentils. Food, under such circumstances, was apt to become mouldy, and the microscope revealed the presence of certain lower vegetable organisms or fungi, some of which were decidedly poisonous to animals. He knew of many cases of such poisoning, which were clearly attributable to the fungi attached to food in the condition he had referred to. Professor Varnell, whom he was happy to see present, had informed him of a case of poisoning arising probably from musty food, and that gentleman would probably favour them with his experience. Whilst laying full stress upon the importance of this point, he could not agree with his friend Professor Coleman when he said that the absence of any analytical tests was one of the greatest impediments in securing pure linseed cake. They could examine, analytically, many kinds of cake for the presence of certain injurious materials. Rape cake admitted of an easy test. The presence of mustard was rapidly traceable by the formation of a pungent essential oil, when the crushed cake was mixed with lukewarm water, and allowed to stand for several hours. In addition to many other tests they had the microscope, which, in conjunction with the natural senses of taste and smell, was as good an analytical test as they could desire in such matters. One point in which he did not agree with Professor Coleman was in the statement that there was difficulty in procuring pure and clean linseed cake. There was a wholesome regulation in the seed-crushing trade of paying a price for the seed in proportion to its freedom from foreign substances. Beyond 5 per cent., which was the standard of foreign matter, an allowance in price must be made proportional to the amount of adulteration. There was no doubt, by paying a proper price, pure linseed could be obtained, and, therefore, pure cake; and he believed there was no indisposition on the part of the crushers to manufacture pure cake if they were paid a fair price for it. At the same time, he was aware that a great deal of oil-cake was sent into the market with the mark "P"—pure—upon it which was very largely adulterated by foreign matters. If farmers would have their cake tested under the microscope, which they could do at little expense, they might always secure good cake; and if there was a demand for that quality of food he had no doubt it would be supplied. With these trifling points of difference only, he entirely concurred in all that had been stated by Professor Coleman.

After a few remarks from Mr. Varley,

Dr. Crace Calvert, F.R.S., said he had listened to the paper of Professor Coleman with the greatest pleasure; the more so as it had reference to a subject which, up to the present time, he believed, had received the attention of very few scientific men. If there was any knowledge on the subject amongst farmers, most of them had kept it to themselves, and he believed the public in general were not acquainted with the facts brought before them in this able paper. He had read a great number of papers from time to time respecting the feeding of cattle, and he had always been struck with the want of practical knowledge shown by those engaged in such researches, for those who had devoted any attention to this subject were, generally speaking, purely scientific men. There were on the Continent several eminent chemists who had given a great deal of attention to this subject, and at some future period he (Dr. Calvert) might have occasion to refer to some of their researches, and he would then be able, in a more forcible manner, to prove the truth of his assertion; but his point now was to show, in as marked a manner as possible, the want of practical information which Professor Coleman's paper had gone so far to supply. Thus it was found that Mr. Boussingault, one of the leading scientific chemists of Europe, attempted to feed some cows on carrots, as he thought it admirable food for them, but they decreased in weight and lost flesh. Why was this? Professor Coleman had given the explanation, that it was necessary that there should be bulk in the food as well as nutriment, and the great point was to give both in proper proportions. The Chairman had mentioned that in his own case he gave his sheep too much chaff in that instance; the bulk was too great as compared with the nutritive matter contained in the chaff. There was one very interesting point which Mr. Coleman had referred to, namely, that it was not sufficient merely to give an animal a large amount of nitrogenated food, but in order to get the full effect from such food, it was found necessary that it should be mixed with a relative proportion of saccharine, amylaceous, or other heat-giving food. This confirmed the impression that he (Dr. Calvert) had had for many years, that such ratios between the various classes of food must be carefully preserved. He had been led to this view by the researches of one of the most intelligent chemists on the continent, M. Ville, who investigated the application of ammoniacal salts and other nitrogenated manures to the growth of plants, and made this interesting observation, that if to plants a certain quantity of ammoniacal salts or nitrate of soda were supplied, only a limited amount of nitrogen was absorbed, but if to these nitrogenated substances phosphate of lime was added, the result was most favourable, the plants absorbing eight or ten times as much nitrogen in the same period of time; the absorption of the nitrogen being nearly in a direct ratio to the proportion of phosphate of lime added. With respect to the feeding of cattle, he was struck by the remark of Professor Coleman, that if they gave to cattle too much of one class of food, either of fat-forming or respiratory food, there was a loss. It therefore occurred to his mind that both for men and cattle (for what held good in the one case held good also in the other) there must be a definite ratio of food which time and science would reveal. He was satisfied, from his own experience, that the paper read this evening was one most valuable to the farmers of this country, because the science of the subject was mixed up with sound practical knowledge, and that was the class of information which the farmers most required.

Prof. Varnell said reference having been made to his name in connection with the poisoning of cattle from the presence of injurious substances in the food, he would briefly state the circumstances of the case. He would in the first place endorse the opinion expressed by Dr. Voelcker, as to the importance of the microscope in these investigations, and every feeder of cattle ought to be possessed of that instrument and know how to use it properly. Two or three years ago he was professionally applied to on the occasion of the death of some valuable cows in an apparently mysterious manner. He found the cause of death to be spleenic apoplexy. At first he gave an opinion that perhaps some fungi attaching to the food had been taken into the system, and on investigation he found that the cattle afflicted had been grazing on ergotised rye-grass. He was very glad Professor Coleman had laid so much stress upon diseases arising from indigestible food. He had met with many instances of deaths of animals from eating decorticated cake, and in some cases from feeding largely on bean straw, the straw not having been cut in the green state, but allowed to become over-ripened on the ground where it was grown. With reference to the circumstance alluded to by Dr. Voelcker, of fungi forming upon oats stored in damp places, he would mention a fact of importance to feeders of cattle. He was applied to from Leeds respecting the death of half-a-dozen horses, which occurred in about three days, and the cause of which it was difficult to trace. A quantity of the oats on which they had been fed was sent to him for examination, and he found that many of the grains were matted together by a flocky substance. Microscopical investigation showed the presence of distinct fungi as completely developed as mushrooms, though very minute. The flocky material proved to be jointed filaments, and the effects of eating that substance had been to produce the death of the horses. He tried the effects of the oats which had been sent to him upon other valueless horses, which died thirty-six hours after eating them, with the same symptoms exhibited. On an examination of the smaller intestines of the animals he found that the mucous membrane was thickened by a peculiar growth on the surface.

On the motion of the Chairman, a vote of thanks was passed to Professor Coleman for his paper.

Professor Coleman thanked the meeting for the attention with which they had listened to his paper, and he was glad it had led to some practical remarks in the discussion. With reference to the observations of Dr. Voelcker, as to the absence of analytical tests of food for cattle, he did not state that such tests did not exist, but that they were very seldom employed by farmers. He thought the want of appreciation of these tests was a great error on the part of consumers, and he certainly strongly advised the use of the microscope in such matters.

SOUTH LONDON WORKING CLASSES INDUSTRIAL EXHIBITION.

The prizes awarded to the exhibitors at this exhibition were presented on Saturday, the 1st instant, by the Right Hon. Viscount Palmerston, K.G.

The noble lord was accompanied by the Earl of Shaftesbury, the Right Hon. W. Cowper, Mr. Locke, M.P., Mr. Charles Gilpin, M.P., and many others.

Mr. Murphy, the honorary secretary, then read the report of the adjudicators, which stated that they deemed it desirable that, whatever the profits of the undertaking, they should be distributed among as many exhibitors as possible, rather than be expended in giving large sums to a few; this would account for the great number of prizes awarded and honourable mentions made. It was also deemed advisable that the awards should be of equal value in the different classes, and that a medal should be struck to commemorate the holding of the exhibition, a copy of which (in either silver or bronze) the holders of the superior prizes might take as a portion of the value awarded. The accounts had not yet been audited, but the distribution assumed a profit of £300. The first-class prize was £3, the second £1 10s., the third-class prizeholders would receive a bronze medal in case; and a highly ornamented card was prepared for those who had received honourable mention. Whatever sum of money might remain over when a settlement was made would be distributed in fair proportions, as per the vote of the committee. The following is a summary of the awards :—First class, 35; second, 85; third, 123; honourable mention, 129; total, 372. It may be interesting to state, that out of 120 first and second class prizeholders, 110 have chosen that a portion of their prize should consist of a medal as per the prize design. Of these 77 have chosen silver, and 33 bronze mementoes of the Exhibition.

Lord Palmerston distributed the prizes, and then delivered an encouraging address, pointing out the favourable influences of such exhibitions. The Rev. Mr. Bowstead moved, and the Rev. Newman Hall seconded, a vote of thanks to Lord Palmerston.

DUBLIN INTERNATIONAL EXHIBITION.

The fine art collection from Rome will be very rich. A steamer, freighted with more than 100 works in sculpture and other articles, was to leave Civita Vecchia direct for Kingstown on the 1st of April. Among the artists who contribute works are the following:—G. B. Lombardi, 7 works; Benzoni, 16; Jacometti, 5; Adams, Carlo Voos, Bisetti, Rinaldi, Kowalsky, and others, 4 each; G. Lombardi, Barrotta, L. Bienaimé, Andrei, and Miss Foley, 3 each; Miss Stebbins, Muller, Forzani, Setaccioli, Luccardi, Provinciali, Galletti, Ferraria, and Larchetti, 2 each; Hogan, Achterman, A. Bienaimé, Story, Baroni, Bizzi, Majoli, Moratilla, Rossetti, Valli, Prior, Di Giacomo, Salvatore, Obici, Hoffman, Schoops, Freund, Palombi, Giacomini, and Daly, 1 each. Mr. Randolph Rogers, the American sculptor, has consented to send a half-size figure of his well-known statue of "Nydia fleeing from Pompeii," from Bulwer's novel. Miss Hosmer has a group, and there is a colossal statue of Pius IX. in marble. There are also others, not specified.

Among the painters are Romako, de Rossi, Vertunni, Wider, Guerra, Bompiami, Muller, Bertacini, Brenan, Skirmunt, Farrel, Porcelli, Podesti, Strutt, A. Dies, Baggio, Rohden, Bartolomei, &c. Saulini sends twenty of his own cameos in shell and pietra dura.

Pieret sends a collection of very rare and valuable intaglios and cameos in pietra dura. Monsignor Ferrari (Minister of Finance) sends three portfolios and three volumes of engravings. Olivieri, specimens of bookbinding. Cardinal Prince Altieri sends, by the arrangement of Professor Ponzi, an interesting collection of minerals and maps of the Alumiere and Tolfa; Castrali, wax candles; Tucri, olive-oil; the Countess Mami sends sulphur products from Canale; Pozzi, artificial pearls; Dies, Rimaldi and Barberi send mosaics, the latter 41 specimens. The Pope also sends mosaics from his own works in the Vatican and specimens of his chromo-lithography. The Minister of Public Works sends specimens of the works of Vizia in cloth of silk and gold, as also specimens of Roman carpets; Martinori, two discs of Egyptian alabaster. Nazzari sends liqueurs, chocolate, and sweetmeats. Toni, the gun-maker, some guns. Vespignani, frame-work in ivory and gold; and Cavaliere De Rossi sends a most interesting plan of the Catacombs.

The colonies will be admirably represented as far as the restricted space allotted to them will allow.

From Natal, principally through the active instrumentality of Mr. John Robinson, a very fine collection has already arrived by the steamer Eastern Province, and a further consignment will come by the next mail steamer. Among the Natal collection are some most interesting curiosities and native manufactures, from Central Africa, collected by Mr. Barry and Mr. Baldwin, during their recent travels. The first-named gentleman has done what no European has done before, namely, crossed the continent from Walvisch Bay to Natal. He has been just a year on the way. The indigenous timber resources will be well represented in about forty varieties of colonial woods, contributed by Dr. Mann and Messrs. Topham, Brothers. Among the Bechuana articles worth notice are the poisoned arrows, the poison being obtained from a small beetle; a large native pot, of superior workmanship to anything known in South Africa; ropes, twine, and fibres from the vicinity of the Great Lake; a sheathed war-knife from a tribe never visited by white men, living in that unexplored coast district on the south of the Zambezi. The raw materials of the colony, cotton, wool, sugar, colonial spirits, coffee, maize, tobacco and cigars, preserved fruit, &c., are well represented. The collection also includes photographs, Zulu curiosities, including a most elaborate piece of Zulu wood carving, which took three years to complete. There are also karosses, or cloaks, of jackal and other skins; two splendid lion skins, one a thick-maned specimen; some magnificent bows, and other native weapons. The African Aid Society, the Church Missionary Society, the Liberian Consul-General, and others contribute African products.

Malta will make a fine display of laces and silver filigree.

OPERATIVE COACHMAKERS' EXHIBITION.

The prizes awarded at this exhibition by the judges—the Marquis of Lansdowne, Viscount Torrington, R. C. Mansell, Esq., Mr. Hall, of Long-acre; Mr. Holdway, of Mount-street; and Mr. Rock, of Hastings—were distributed on Monday evening last, by the Right Hon. Lord Truro, in the great room of the Society of Arts. On his lordship taking the chair,

Mr. G. N. Hooper, chairman of the committee, read an address expressing their satisfaction at the success of the exhibition, which had exceeded their most sanguine expectations. They had received the most cordial assistance from all parties, and hoped that this success would open a new era to employers and operatives of the coach-making trade, who would now, they hoped, maintain their place against the competition of foreign countries. They had enjoyed the advantage of a thoroughly independent committee of judges, and it had been considered advisable to distribute the awards liberally where merit existed, notwithstanding the absence of competition in many cases. They hoped that this liberality would act as a stimulus for the future, and that a keener competition would be the result in the next exhibition. The address concluded as follows:—"Meeting as we do in the house of the Society for the Encouragement of Arts, Manufactures, and Commerce, we are reminded that a work small at its commencement may grow in the course of years to national importance. We cannot look forward to benefit the nation so extensively as this great and noble Society, but at a humble distance we have endeavoured to follow their example, and originate what we hope may confer great benefit on the carriage operatives, and indirectly the whole nation to which they belong. All honour to the Society of Arts, which by its example and enterprise has endeavoured to elevate the character of working men; among its efforts the encouragement of Working Men's Exhibitions will doubtless effect much good, and facilitate many other good plans for helping them to help themselves, rather than allowing them to rely blindly on employers and the government in matters where personal character that is self-reliant can effect more than any external help whatever."

Lord Truro then presented the prizes as follows:—

The Society of Arts prize for the best specimen of chasing, to J. Corbett; the Coachmakers' Company's bronze medals, to F. Humphreys, John Adcock, H. Pilbeam, and J. Bassett; the Master of the Coachmakers' Company (Thos. How, Esq.), for the best design of an open and close carriage combined, to W. T. Allam; Mr. G. N. Hooper's prize of three guineas for a drawing of a barouche, W. C. Bolt, and of two guineas for a drawing of an hospital carriage, James Robinson; Mr. G. A. Thrupp's prizes of two guineas for the best stuffed cushion in morocco, Henry Headford, and for the best drawing of an under-carriage, Henry Semon; Messrs. Woodall's prizes of two guineas for the best panel of carriage painting, John M. Dean, and for the best finished pad and bridle, Edward Spendlove; and of one guinea for the best hand-sawn dash iron, Wm. Wood; Mr. Barlow's prize of two guineas for the best set of harness furniture, new design, to H. Birch; of half-a-guinea for the best working drawings of bridle fronts, R. Burgess; for the best specimens of hard-solder plating and soft-solder plating, D. Jones and W. Sheldon. The committee's prizes—of two guineas, for the best specimen of heraldic painting, to J. J. Cowens; for the best specimen of decorative coach carving, J. Wyatt; for the best set of working drawings for an improved brougham carriage, A. Brewer; for the best specimen of sham caning, C. H. Fuller; for the best seat, the border sewn by hand, T. Robinson; for the best method of detaching fallen horses, J. Hammerton; for the best cushion, stuffed and quilted, A. Townsend.

Certificates of merit were next presented:—

For drawings of carriages to Joseph Butler; model of a landau, J. J. Norcott; drawing of improved hinge, Charles Toogood; model of improved hinge, a photograph and rule, John Weekes; apparatus for drawing C springs, Alfred Brewer; machine for drawing off fast-set axles boxes, J. Smith; painted spokes, sham caning and striping, W. Hewitt, jun.; a plain varnished panel, J. Gibbs, imitation basket-work, &c., W. Ninham; six spokes painted, W. Simpson; panels of various colours, Henry Smee; a spring cushion, Carl Moller; a carriage seat, caned beneath and improved cushion, William Stephens; a model of a hammercloth, William Woolford; an improved awl, saving prick marking, Henry Wyatt; specimens of soft silver plating, George Coster, a case of lamps, the workmen at Mrs. Salsbury's; a panel of monograms, F. V. Hadlow; chased door handle and harness ornaments, Joseph Little; drawings, of drag, barouche, &c., S. H. Birch; coloured drawing of dress coach, J. Hewitt, jun.; various drawings of carriages, P. Boduwart; models of railway carriages, Wm. Hacker; brass model of carriage with portable railway, James Henwood; model of a state hammercloth, a straining joint, W. J. Murlis; a self-acting step to fold up under when carriage door shuts, H. S. Dobson; model of a brougham, J. T. Brown; new and inexpensive Venetian blind, J. J. Tattam; drawing of state harness, C. Muckersie; driving cushions of new designs, J. W. Berriff.

The prizes having been distributed, the Chairman said he regretted the absence of the Marquis of Lansdowne, who was much more intimately acquainted with the subject than himself. He hoped some of those who had been unsuccessful would not feel discouraged, for many of the articles now not successful might contain the germs of inventions likely to be valuable in future. The coachmaking trade required as much skill and ingenuity as any branch of industry. He observed with pleasure that the largest number of prizes had been given for what argued a high standard of education in the recipients. Twenty-one prizes for artistic merit had been awarded, thirteen for mechanical contrivances, and seventeen for manual skill.

A vote of thanks to the Chairman concluded the proceedings.

PARIS UNIVERSAL EXHIBITION, 1867.

The following is a translation of the official announcements published in the *Moniteur* of the 21st Feb., 1865:—

Report to the Emperor.

Sire.—In conformity with your Majesty's order, I have had the honour to inform his Imperial Highness Prince Napoleon that the time has arrived for him to become the president of a commission which will be formed for the purpose of carrying out the decree of the 22nd June, 1863, for the holding of a universal exhibition in 1867. I have prayed his Imperial Highness to be good enough to communicate to me the general views on such an undertaking, suggested by the experience gained by him in 1855 and 1862, and then to call a meeting of competent men to discuss the preliminaries of such a subject. I now submit to your Majesty the conclusions drawn from these preliminary measures. The next important point being a good financial organisation, I have referred to the results drawn from the two exhibitions in London and the one in Paris.

In London, in 1851, as well as in 1862, the initiative was taken by a number of persons who raised a guarantee fund, upon the faith of which the Bank of England supplied all the necessary funds at a moderate rate of interest. The commission for 1851 built a temporary structure, with a boarded area of 71,000 square metres (ground-floor and galleries); the receipts amounted to 12,700,000 francs, and, after defraying all expenses, a surplus of 5,300,000 francs remained. The commission of 1862 raised a building of 120,000 square metres in area, a part of which was designed to be permanent. The total receipts, with a grant of 250,000 francs from the contractor, just sufficed to cover the whole expenditure of 11,500,000 francs. At Paris, in 1855, the State, in undertaking the enterprise, was obliged to erect temporary buildings of 68,000 square metres, in order to supplement the area of 47,000 square metres provided by the permanent building erected by a company. The receipts amounted to 3,200,000 francs, and there was a total loss of 8,100,000 francs. It was ultimately determined to expend a sum of 11,000,000 francs for the re-purchase of the palace. The total expense, amounting to 21,000,000 francs, is covered partly by the possession of the Palais de l'Industrie.

In the face of these facts the question arises whether the system of commissions, such as conducted the two exhibitions in England, the one at a gain, and the other without loss, should be adopted; but, influenced by the subjoined conclusions, I am induced to give a negative reply.

In England the public willingly pays high charges to procure for itself the means of instruction, or to visit Institutions devoted to science and art. Thus, in London, in 1862, a sum of 10,200,000 francs was received from 6,000,000 visitors, raised—first, by the minimum entrance fee of one shilling (1f. 25c.), and secondly, by season tickets and entrance fees varying from 2s. 6d. to £1 (3fr. 10c. to 25 francs). In France, until recently, the public were but little inclined to pay or bear such charges. Thus, in Paris, in 1855, 4,600,000 visitors only paid a sum of 3,200,000 francs; the entrance fees, at 20 centimes and at 1 franc, produced 2,600,000 francs, whilst those at 2 and 5 francs, with the sale of season tickets, produced but 600,000 francs. Assuredly better results may be expected in 1867; peace will be more fruitful than the war which was raging in 1855; the errors incident to a defective tariff will be avoided; finally, the public favour may be better relied on, if a competent commission punctually inaugurates the exhibition of 1867 on the day fixed for the ceremony, if it solves the problem of classification of the products of art and industry in a useful and attractive order, and if, above all, the productions of all the countries in the world are represented more completely than has been the case in previous exhibitions. Still it seems prudent to expect that, even under these conditions, the receipts at Paris in 1867 will not be so great as those in England in 1851 and 1862.

The financial success of 1851 was caused by circumstances which evidently will not occur again. The demands of the exhibitors for space were then satisfied by a building of 71,000 metres; but in 1862 even an area of 120,000 square metres was so much too small that the French exhibitors received hardly half the amount of space they applied for. The requirements of exhibitors of all nations had thus augmented, whilst public curiosity remained stationary. These two tendencies foreshadow considerable deficit in all future exhibitions; and it appears that the way to lessen this deficit in 1867 will be, especially, to develope those branches of the exhibition which will augment the receipts in a larger proportion than the expenses. To attain this end it seems likely that a space of 140,000 square metres will be necessary. At London the chief sources of receipt, viz., the entrance fees, were increased by certain percentages taken by the commission on the profits of the contractors for the refreshment rooms, the catalogues, and on seven other sources of smaller importance. In 1862, for instance, these accessory receipts amounted to 1,000,000 francs. I do not think that in 1867, any more than in 1855, it would be well to have recourse to these financial means, which are hardly in accordance with our ideas. By organising monopolies the public is badly served, and thereby become discontented: no good is thus done to the chief source of receipts. These sorts of tax weigh, moreover, partly upon the exhibitors or their habitual representatives; and it seems injudicious to cast a burden upon so many people whom it is desirable to attract to these competitions, and who, often through a pure spirit of patriotism, are willing to bear the considerable expenses which arise from them.

In London, at the two preceding exhibitions, rewards of no intrinsic value were given to exhibitors. In France, since the Farnese Exhibition, in addition to the bronze medals, silver or gold medals have been given. I think it will be well to continue this custom, and even that it will be desirable to augment the sum devoted to prizes given in other forms.

In founding my opinion upon these considerations, I can foresee that the Exhibition of 1867 may, perhaps, require an expenditure of 18,000,000fr. I may add that the unfavourable contingencies which may happen to these kinds of enterprises do not seem likely to raise the expenditure above 20,000,000fr.; as for the receipts, they may probably amount to 7,000,000fr. or 9,000,000fr. I therefore come to the conclusion that the undertaking may cause a deficit of 12,000,000 fr. These estimates cannot vary much, whether they be applied to an entirely private undertaking, or to an exhibition carried out under the control and direction of the Government. No company having only a speculation as the object in view would propose to undertake the Universal Exhibition of 1867, unless guaranteed against inevitable losses by a subsidy, direct or indirect, at least equal to the anticipated deficit. Thus, from the financial point of view, the State would gain nothing by giving up all control over the preparation and conduct of the enterprise. Perhaps it might be said that the public interest which is the motive that induces the Treasury to participate in the expenses of this undertaking, does not permit the Government to hold itself aloof, and, moreover, it may be doubtful whether this independence would add to the *éclat*, utility, and to the success of the scheme. On the other hand, it may be admitted, without exaggeration, that in following the system of administration adopted by France in 1862, that is to say, in maintaining firmly unity of action, and strict superintendence, it may be, on this occasion, again possible to make some important reductions in the estimates. The utility of exhibitions has been clearly demonstrated by the considerations stated in the report which my predecessor had the honour to submit to your Majesty, and upon which the decree of the 22nd of June, 1863, was founded. Upon referring to these considerations I find that the State and the City of Paris have a sufficient interest in the realization of your Majesty's idea, to justify their participation in such an expenditure, by means of a subsidy. This subsidy, limited to 12,000,000 francs, might be divided in equal portions between the Treasury and the City, which, by means of this grant, would be released from all responsibility if the undertaking entailed any unlooked for expenses. The Prefect of the Seine, with whom I have consulted on this point, does not hesitate to think that the municipal council of Paris, which is always well disposed towards anything useful or generous, would not decline this participation. As for the balance estimated at 6,000,000 or 8,000,000 francs, it would be covered by the fees taken for entrance, and in case of their insufficiency, by the guarantee fund of a society formed for this purpose, under the auspices of the imperial commission. In the event of the total receipts, compared with the excess of expenditure above the 12,000,000 francs of subsidy given by the State and by the city of Paris, leaving a surplus due to the favour of the public, and the good management of the undertaking, it would be distributed in equal parts between the State, the city of Paris, and the guarantee society. By this means, Sire, industry and commerce, which are called to contribute to the *éclat* of this undertaking, and to gather advantages from it, will find themselves at the same time both taking part and interest, in the only way which the customs of our country permit, in its organisation and in the chances, either adverse or successful, which it may offer in a financial point of view. This would be at the same time a first step made in the direction of the initiative undertaken by our neighbours with so much firmness and success, and a homage rendered to the spirit of association. The natural consequence of this organisation would be to give to the guarantee society, in the working and superintendence of the enterprise, a part proportionate to its interest in it. The imperial commission might be, then, composed (in addition to its president and the ministers whose functions would qualify them for a seat at the board) of forty-one persons, chosen by the Emperor, from the competent and known persons of the State and the city of Paris, and of nineteen persons to be elected from among the guarantee society in the most practicable manner. The chances of success for future exhibitions would be increased by associating each time with the directing power persons possessing the experience of other exhibitions held previously in other countries. England being the only foreign nation which has up to the present time undertaken these kind of enterprises, I propose to your Majesty to include the names of three Englishmen in the imperial commission.

If your Majesty approve the conclusions of this report, I pray that the annexed decree may be signed.

I am, &c., &c., Armand Behic,
Minister of Agriculture, Commerce, and
Public Works."

Napoleon,

By the Grace of God, &c.

Upon the proposition of our Minister of Agriculture, Commerce and Public Works.

Considering our decree, dated June 22, 1863, ordering an Universal Exhibition of Agricultural Products and Industry to be held in Paris, and opened on May 1, 1867;

Considering our decree, dated the same day, ordering a Universal Exhibition of Fine Arts to be opened on May 1, 1867, at the same time as the Universal Exhibition of Agricultural Products and Industry,

Have decreed and decree as follows:—

Art. 1st. The Universal Exhibition of Agricultural Products, of Industry, and Fine Arts, is placed under the direction and superintendence of a Commission, to be presided over by our well-beloved cousin, Prince Napoleon.

Art. 2nd. The following are nominated members of the Commission:—

His Excellency the Minister of State; His Excellency the Minister of Agriculture, Commerce, and Public Works; His Excellency the Minister of our Household and Fine Arts; Messrs. Barbier, Member of the Council of State, Director-General of Customs, etc.; His Excellency M. Baroche, Minister of Justice, etc.; Messrs. Elie de Beaumont, Senator, Member of the Institute, Boittelle, Préfet of Police; Michel Chevalier, Senator; Member of the Institute; R. Cobden, M.P., of England;

Lord Cowley, H.B.M. Ambassador at Paris; Deniere, late President of the Tribunal of Commerce, etc.; Denion du Pin, Administrator of the Messageries Impériales; Devinck, late President of the Tribunal of Commerce, etc.; Jean Dolfus, Manufacturer; Arlès Dufour, Member of the Chamber of Commerce of Lyons; Dumas, Senator, etc.; Dupuy de Lôme, Member of the Council of State, etc.; Favé, Colonel of Artillery, etc.; Fleury, Director-General of the Breeding Studs; His Excellency M. Fould, Financial Minister; Frémy, Governor of the Credit Foncier; Garnier, Metal Merchant, etc.; Gervais de Caen, Director of the School of Commerce; Gouin, Member of the Chamber of Commerce, etc.; Lord Granville, the Lord President of the Privy Council of England; Baron Haussmann, Senator, Préfet of the Seine; Herbet, Member of the Council of State, etc.; Ingres, Member of the Institute; La Roncière le Noury, Rear-Admiral, etc.; Marquis de Lavalette, Senator; Leboudy, Member of the Municipality of Paris; Lefuel, Member of the Institute; Le Play, Member of the Council of State; His Excellency the Duke de Morny, President of the Corps Législatif; His Excellency M. Mague, Member of the Privy Council; Onfroy, late Manufacturer, etc.; Ozenne, Member of the Council of State; the President of the Chamber of Commerce of Paris; The President of the Tribunal of Commerce of Paris; Schneider, Vice-President of the Corps Legislatif; Thouvenel, Senator.

The Commission will be ultimately increased to sixty members, exclusive of the President, the Minister of State, the Minister of Agriculture, of Commerce, and Public Works, and the Minister of our Household and Fine Arts.

Art. 3. In the case of the absence of H.I.H. the Prince Napoleon, the commission will be presided over by the Minister of State, or by one of the two Ministers of Agriculture, of Commerce, and Public Works, and of our Household and Fine Arts.

Art. 4. M. de Play is appointed General Commissioner.

Art. 5. M. de Chancourtois, Chief Engineer of Mines, is appointed Secretary.

Art. 6. Our Minister of State, our Minister of Agriculture, of Commerce, and Public Works, and the Minister of our Household and Fine Arts, are charged, each one as it concerns him, with the execution of the present decree. Done at the Tuileries, Feb. 1, 1865.

Napoleon.

Minister of Agriculture, Commerce,
and Public Works,
Armand Behic.

Fine Arts.

Pompeian Curiosities.—The activity of the new Italian Government has produced, from beneath the scoria from Vesuvius that nearly two thousand years ago entombed the town of Pompeii, such an immense number of objects of utility, luxury, and curiosity, that the Museum of Naples is full to overflowing, and the authorities are puzzled how to turn these interesting relics of Roman civilization to the best account. Galleries, lofts, and cellars are crammed with objects from Pompeii, which continue to pour in from the excavations now being carried on with more ardour than ever. When Pompeii has been exhausted there will remain Herculaneum and other places over which the volcanic shroud has scarcely yet been disturbed; in short, the whole of the buried utensils and works of art, which time has not yet destroyed, of several large and populous towns. It is evident that no one museum or series of museums can conveniently receive and exhibit such a mass of antiquities, and all kinds of propositions have been made to meet the difficulties of the case. One scheme is to replace the various objects in the houses from which they came, and thus make a magnificent museum *in situ*, a taking proposal, but which is rendered impossible from the immense cost of protecting the objects from further decay and ensuring their security. Another plan is to add a disused convent to the *Museo Borbonico*, but this would be only putting off the matter and making the collection more unmanageable, less capable of arrangement than at present. In fact, the greater portion of the objects collected are almost repetitions of each other, and the museum would be infinitely more useful to the archæologist and artist if it contained only the best examples in each class, or, at any rate, just sufficient to illustrate every point, and thus bring all into view; and it appears now to be the prevailing opinion that the best method as regards the museum in question will be to preserve in it only unique and choice specimens. The next question is—What is to be done with the enormous remainder? And it is said that the government has determined on the enlightened and liberal course of distributing its superfluity amongst not only the other museums of Italy, which require completion, but also those of other countries. If such a plan should be carried out, the Italian government will earn the admiration and gratitude of every scholar and man of taste, and there is little doubt that such a generous act would not be without its advantages, and Italy might in return receive valuable articles in exchange from other countries. Such an interchange of the products of man's ingenuity would fill a worthy page in the future history of the nineteenth century.

Manufactures.

Sugar Manufacture.—Messrs. Travers and Son, in their circular, speaking of the question of the sugar duties, say:—"Sugar, as presented to us by nature, is a colourless substance—a little troubled with saline matter, and largely diluted with water, but quite guiltless of treacle, glucose, or dirt. The juice of the sugar-cane contains about 80 per cent. of water, less than 1 per cent. of saline matter, and rather more than 18 per cent. of saccharine. The saline matter is easily got rid of, and if the water were evaporated at a low temperature, the residue would be colourless sugar, as nature intended. Let us now see how man has treated this excellent gift. The primitive mode of preparing sugar was (we may safely say is, in many instances) to boil the liquor in open pans till the bulk of the water had evaporated, and the syrup had thickened. This syrup was then poured into porous vessels or baskets partially filled with clay, through which a large percentage of a dark-coloured viscous substance called treacle percolated, and the remainder, now styled raw sugar, was fit for market. Now, in this word *raw* there lurks a fallacy. It is correctly enough applied to silk or cotton in their unmanufactured state, but raw sugar is already a manufactured article; and, what is more, the term implies that such sugar is the necessary product of a primary process, and that a second process is requisite in order to convert the raw sugar into refined. Thousands of persons, no doubt, think so at the present moment. They regard brown sugar as a natural product—white sugar as a manufactured product. The idea is totally without foundation. In reality, the second process only undoes the mischief which has been accomplished by the first. Everybody knows that a piece of bread held in front of a brisk fire speedily becomes brown. This is because the sugary constituent in the flour is charred by the heat. And, in like manner, sugar-syrup, when boiled in an open pan at a temperature varying, according to the density of the syrup, from 220 to 250 degrees, becomes burnt or carbonised. Each delicate little white crystal puts on a brown coat, while the greater part of the molasses is produced through the same cause, being, in fact, nothing more than crystallisable sugar converted by excessive heat into uncrystallisable treacle. We can understand this rude and ignorant mode of manufacture existing in former times, when the material arts were very slightly developed, and when sugar in the crudest state was hailed as an acquisition; but how comes it that at the present time, although we in Europe have invented vacuum pans, centrifugal machines, charcoal vats, and all sorts of appliances for turning brown sugar into white, that the bulk of our sugar is still shipped from the place of growth in what we may justly style an artificially-injured state? Is it that the colonial and foreign growers are too lazy and apathetic to make it any better? They are scarcely likely to be less enterprising now than they were two centuries ago, and we find that in the year 1680 the West India Islands possessed several establishments for producing white sugar. But two years later the French Government imposed an extra duty on the importation of these white sugars, and in 1684 it forbade the erection of any new colonial refineries. Two reasons were assigned for this narrow policy:—the first, that as sugar had become a valuable source of taxation, a less weight, paying consequently a less tax, would be imported if sugar were refined abroad, and freed from molasses and impurities before shipment; the second, because, in accordance with the false political economy of those times, it was considered necessary to bolster up the European refiner, and protect him from the competition of his colonial rivals. We now begin to see how it is that a clumsy and wasteful process of manufacture, begun in simple ignorance, has been artificially perpetuated up to the present time by Governments insisting that brown sugar should pay one rate of duty and white sugar another."

Commerce.

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Cotton Supply.—Messrs. George Fraser, Son, and Co., in their monthly prices current, dated 1st April. say, "Great as was the fall in the prices of cotton during the months of January and February, it was still greater in March, and amounted to an average of 4d. to 5d. per lb. on all descriptions of long stapled kinds, and of 2½d, to 4½d. variously on short stapled. As compared with the actual prices current prior to the stock taking at the end of December last, the quotations in yesterday's Liverpool circulars are marked at nearly but slightly over one-half those prices for American, Brazil, Egyptian, and West India descriptions, but at less than one-half for Bengal, China, and other short stapled descriptions, which are comparatively neglected by spinners even at the very low rates to which they have fallen. The causes of this great decline are to be found chiefly in the belief, increased by each successive arrival of news, of the approaching end of the American war, owing to the supposed inability of the South to continue the struggle for a much longer period; and from the weakness of the holders of cotton, owing to the enormous losses sustained, and yet to be sustained, on the unsold stocks, and the supplies yet on the water, as in none of the cotton-producing countries has the price fallen in anything like the same degree as in Liverpool. There has also been great difficulty in moving any large quantity of cotton out of first hands, owing to the deadness of speculation, and to the continued cautious policy of the trade in purchasing merely to about the extent of their weekly production. To these causes may be added the general want of confidence arising from past overtrading, and the enormous losses making on all the other trading articles of produce from excess in supplies stimulated by too easy credit, and which are now bearing their natural fruit in the almost daily occurrence of large failures, with the apprehension of others. Thus the Liverpool Cotton Market has been throughout the month in a state of semi-panic, and although for the moment the decline seems once more arrested, and during the last two days cotton has been in better demand, and at improving prices, there seems no feeling as yet of certainty that the improvement will, like so many that have preceded it, prove more than temporary, inasmuch as the news just to hand from America is of the same tenor as that which created the previous depression, being regarded as generally unfavourable to the South. Apart from the expectations of a speedy end to the war in America, which, however probable, is as yet very far from certain, and may so remain until one or more great battles have been fought, and their issue determined, the decline in the price of the raw material would probably be found excessive, looking fairly at the facts of the case; for, taking the actual stock, as by yesterday's stock-taking ascertained to be in Liverpool, of 580,000 bales, and adding thereto the stock in London of 126,735 bales, we have a total of 706,735 bales against 388,082 bales in those ports at the same time last year. And there are now 74,207 bales in the continental ports against 58,392 bales at same time last year. These heavy stocks account in a great measure for the weakness of holders. But when we look to the supplies on the water from India and China, a very different aspect of figures presents itself; for we find that of all descriptions the quantities now on the way are only 339,738 bales against 582,930 bales at the same period last year, or a deficiency of 243,192 bales. It is likely that this deficiency will continue to increase, especially from China, which may not improbably cease its supplies entirely when the low price is known there to which its cotton has fallen; so that there may yet be a better future for cotton if the American war does not actually come to a speedy end, as it is likely the stocks in the ports have in such case attained their maximum or nearly so, and that with the increase of consumption to be anticipated from the raw material being at half the price of three months ago, the stocks in the ports will be slowly at first, but afterwards more rapidly lessened. But this will give no stability to the Liverpool market should the expectations of an end of the American war be kept up. It is more likely in such case, that without peace, with the war still going on, and only expected to end, we may have the staple brought down to peace prices."

Royal National Lifeboat Institution.—The annual general meeting was held on Tuesday, the 14th March, at the London Tavern, the Duke of Argyle in the chair. The Institution had been enabled during the past year to increase considerably their life-saving fleet, which now numbered one hundred and forty-four lifeboats. The Committee adverted to the great loss which the lifeboat cause had sustained by the death of their President, Admiral the Duke of Northumberland, who for fourteen years had actively co-operated with them in carrying out the objects of the Institution. The most striking feature in the history of the Institution during the past year was the large number of splendid gifts, in the shape of the entire cost, amounting to £8,077 11s. 10d., of twenty-five new lifeboats, which had been presented to the Institution by philanthropic persons and collective bodies, in addition to an anonymous donation from "A Friend" of no less a sum than £5,000. During the past year the Institution had sent no less than thirty-four new lifeboats to the coast, and others were in course of construction. Transporting-carriages and boat-houses had been provided, with few exceptions, for the whole of the above-named lifeboats. The lifeboats of the Institution saved no less than 432 lives and 17 vessels during the past year, nearly the whole of them under circumstances when no other description of boat than a lifeboat could with safety have been employed. For these various services, and for the saving of 266 lives by shore-boats and other means, the Institution had granted rewards amounting to £1,539. It was stated that during the last two years about 12,000 persons had been afloat in the lifeboats of the Institution on occasions of wrecks and for practice, and that only three lives had been lost during that period. The lives of between 5,000 and 6,000 persons were placed by shipwrecks on our coasts annually in jeopardy; but owing to the prompt and unceasing exertions that were everywhere made on occasions of shipwrecks, the actual loss of life amongst that large number of persons placed in peril did not last year exceed 450 lives. Much credit was undoubtedly due to the Board of Trade for their continued valuable and cordial co-operation with the Institution. The total number of lives saved from the establishment of the Institution, either by its lifeboats or by special exertions for which it had granted rewards, was 14,266. The committee referred to the cordial continued co-operation of the local Branch Committees, the Coast Guard, and the railway and steam packet companies. Legacies amounting to £3,365 had been received by the Institution during the past year.

Colonies.

Natal.—A Natal paper thus speaks of the progress of the colony in the past year:—"Never before has industrious enterprise on the coast been so rewarded. Fact has outstripped anticipation. A series of favourable seasons has resulted in a sugar crop of unexampled abundance. From all that we can learn, after careful inquiry, it appears, that two-and-a-half tons per acre have been quite the average yield for the year. This is a yield realised very rarely to such an extent in other countries. On many estates, and those, too, that have been worked for some years, three tons and upwards have been realised. More than four tons, in a few cases, and from small patches, has been reported. Although some of the flat valley lands were touched by frost in July, the loss seems likely to be more than made up by the general goodness of the yield. It has been in many respects a good year for the sugar interest. Several new mills have been opened, and a large additional acreage has been put under cultivation. By having command of labour the planters have been enabled to extend their enterprise, and the high prices which ruled about the early part and the middle of the year tended to infuse a spirit of confidence and hope. The year's crop has probably been about 6,000 tons, or more than double what it was in 1863. Coffee culture has been growing rapidly in public estimation, and at this moment plantations are being formed on all hands. The success of the pioneers has induced others to embark their fortunes in an industry that is both pleasant and profitable, and that does not entail the wear and tear of mind and body inseparable from the larger liabilities of the sugar planter. Cotton has been less successful, and we cannot yet pronounce definitively as to the future of this staple. Small plantations continue to be carried on, and superior samples produced; but the profitableness of its growth on a large scale remains a moot question. Arrowroot is advancing again, and the few engaged in its growth find it remunerative. Tobacco, throughout the colony, is a popular product. That our soil and climate are well fitted for its culture cannot be doubted. Both in the leaf and in cigars the quality of the article has been subjected to most conclusive tests. Time and experience are the only essentials required. We have great faith in the future of this plant, and are convinced that it will supply a means of livelihood to a large number of cottage farmers, as well as a source of opulence to larger growers and manufacturers. Flax we hope great things from, and the farmers who have tried its growth are confident still that the plant will thrive when once the preliminary difficulties are overcome. But we should like to see some other staple developed. For oats and oat-hay—the great stand-by in past years—there is only a partial market, and that a local one. Wheat only does in certain localities. The soil is really so fertile, and the climate is so genial, that it cannot be doubted there are many exportable articles which might be successfully acclimatised if the attempt were only made. Stock-farming continues the popular pursuit with our up-country colonists. Sheep increase as rapidly in numbers as they improve in character. Large flocks are brought in from time to time from the other colonies, and the best blood is imported from France and England. Losses are experienced, of course, as they are everywhere, from some of those diseases to which sheep are heir, and from the neglect of proper care in sheltering them from the weather. The uplands are getting by degrees filled up with energetic young English farmers, whose efforts will, we hope, meet with success. Cattle and horse-breeding are, of course, menaced perpetually by the prevalent diseases. The character of both, however, is wonderfully improved. The beef we get now is quite different from the raw junk of old times, while in horse-flesh the introduction of some thoroughbreds has gone far to produce a very fair class of horse. On the whole, in respect of agriculture, the colony has every reason to be thankful."

Products of South Australia.—The production of copper increases steadily in this colony, and should the projected railway to the far north be constructed, mines that will not pay, with present difficulties of transit and high rates of cartage, will most certainly be worked. The wine-growing interest is being steadily developed, and will soon be one of the most important industries. It was expected that, when the Colonial Parliament assembled, a measure would be introduced allowing free distillation for wine growers, coupled with a reduction in the duty of imported spirits.

North Australia.—The government agent has decided on fixing the site of the first town at Escape Cliffs, and it has been named by the Governor-in-Chief, "Palmerston." Natives have not shown themselves in the whole of the Hotham, or, as it will now be called, the Palmerston Peninsula. It is proposed to lay out about two-thirds of the city fronting the sea at the cliffs, which is a fine healthy situation open to westerly sea breezes, and the remaining portion at Port Daly, an inner harbour between the mouth of the river Adelaide and the Narrows. This harbour is safe from all winds, and is deep and capacious. The land around the basin which forms the harbour is low, some of it covered at high water spring tides to the depth of six inches, but there are other portions of the shore which, though low, are still quite free from any tidal influences, the water being deep enough for vessels of any size to lie within a few yards of the shore. Capital only is wanted to make yards and wharves for the convenience of shipping. There is a level road from Port Daly to Palmerston not less than six miles. The whole of Adam's Bay is a sheltered harbour, and for some years to come it is probable that vessels will not enter the inner harbour, as they are almost equally safe outside in a tranquil sea, and they can discharge cargoes by lighters with great facility at Palmerston itself. The stock stations for sheep will be in the Daly ranges, about sixty miles from Palmerston, to the south, and for horses and cattle the flats on each side of the river intervening, where the country is of the richest description, covered with tall grass, which it is scarcely possible to walk through, and abundantly supplied with fresh water by lagoons and running streams, which are found on both sides of the river at intervals of less than a mile. This country will probably form admirable breeding stations, having direct water communication for sixty miles with the shipping. Wool could be produced here as profitably as in the northern runs of South Australia; and there can be no doubt but that the flats of the Adelaide are well suited for cotton. There is a white sandstone which will be found, when quarried, to produce an excellent building stone. Lime, if not abundant, can be had by burning the coral, which can be collected from any of the coral reefs which everywhere fringe the north-west coast.

Obituary.

Richard Cobden, M.P., died on Sunday, the 2nd April. He was born at the farmhouse of Dunford, near

Midhurst, Sussex, on the 3rd of June, 1804, and was thus in his sixty-first year when he died. The house in which he has latterly lived, and which was presented to him as part of the offering of the nation for his services in connection with the repeal of the Corn Laws, was built on the site of that on which he was born. Mr. Cobden's father belonged to the class of English farmers who for so long a period regarded Mr. Cobden as animated with the one sole idea of destroying their present fortunes and future prospects. At an early age he was sent to London to learn business in a warehouse, and he afterwards became a commercial traveller by accident, in consequence of having been requested to undertake the duty for one of his fellow *employés* who had fallen sick. Ultimately the houses which he represented disposed of the business to several of the *employés*, and among them to Mr. Cobden. He appears to have been successful in business, for it is stated that at the time when he first began his career as a public man his share of profits was not much short of £9,000 per annum. In 1834-5 he made a prolonged tour, visiting Egypt, Greece, Turkey, and the United States. On his return he addressed several letters, anonymously, on political and economical topics to the *Manchester Times*, and he also published a pamphlet, entitled, "England, Ireland, and America," by a "Manchester Manufacturer." The views which have now become so familiar as peculiarly his own were boldly stated in this his earliest work, namely, peace, retrenchment, non-intervention, and free trade as the true policy for England. He was elected for Stockport in 1841. Mr. Bright first saw Mr. Cobden about this period at Manchester. The Anti-Corn-Law League—then styled the Anti-Corn-Law Association—was formed in Manchester in 1838, by a body of earnest free-traders, who pledged themselves that their association should never be dissolved until absolute repeal of the corn laws had been obtained. It had its first great public demonstration in Manchester in January, 1839, and then adjourned to Westminster. On the 15th Feb., 1839, Mr. Villiers presented a petition to the House of Commons on the subject, signed by 40,000 people. His motion to hear the parties at the bar of the House was, of course, rejected, and the delegates, at the suggestion of Mr. Cobden, forthwith announced themselves as a league, pledged to agitate by every constitutional method for the attainment of their object. Money was raised, lecturers were employed to diffuse information throughout the country, and pamphlets were distributed. During several years the exertions of Mr. Cobden were unintermitting and herculean. In 1846 the free-trade struggle was crowned with success, and Mr. Cobden, who had sat as member for Stockport from 1841, was acknowledged by Sir Robert Peel as the chief reformer. It was then his old associates got up that great national subscription by which Mr. Cobden's services were acknowledged. Subsequently, while on the Continent, he received the compliment of being elected by the great constituency of the West Riding of Yorkshire. The course taken by Mr. Cobden with regard to the Crimean campaign and the Chinese question provoked much criticism, and, in common with many other politicians, he lost his seat in Parliament. Mr. Cobden filled up part of his leisure by a visit to America. During his absence a reaction set in, and he was elected in his absence for Rochdale. Lord Derby was now for some time Prime Minister, but on the return of Lord Palmerston to power, the Presidentship of the Board of Trade was offered to Mr. Cobden, but declined. The latest service which he rendered to his country was the negotiation of the Treaty of Commerce with France. It is stated that M. Michel Chevalier, on reading a speech of Mr. Bright's suggesting such a treaty, wrote to Mr. Cobden that he believed the time had come when such a suggestion might be carried into effect. Mr. Cobden took up the idea earnestly, and communicated with Mr. Gladstone, by whom it was warmly entertained, and Mr. Cobden, having subsequently seen Lord Palmerston, set out upon his mission, the success of which is so well-known. His labours appear to have been highly appreciated in France. The *Moniteur* in a recent article says:—"Cobden on his death-bed had the happiness to see the politico-economical work, so grandly understood by Napoleon III., shedding its rays over the whole of Europe, under the direction of a French statesman. Herein France was faithful to her initiatory mission. Richard Cobden was able to understand France, and he loved her. France will not forget him."

Notes.

Embellishment of Towns.—M. Warein, formerly *maire* of the town of Hazebrouck, who died a short time since, has left his property to be applied to the improvement of the place of which he was long the chief magistrate, on conditions which (presuming he had no relations) deserve to be noted for the spirit which dictated them. He regrets that the embellishment of the town has not progressed so rapidly as was hoped, and thinks that premiums offered to those who erect buildings with worthy frontages on the main streets and the grand *Place* of the town, may aid the work, and directs that during the next ten years at least that system be tried by means of the revenues from property bequeathed by him for that purpose. He says in his will that he does not desire to supply what the municipal authorities themselves are bound to effect, but to stimulate individuals to aid in the work of embellishing his native town, and expresses his belief that a few thousand francs a year spent in premiums will cause four or five times the amount to be expended in embellishments than would have been without such a spur, and that thus the working classes will each year benefit by so much additional work to be executed. If, in ten years, his executors do not find the plan to answer, they are to employ the property left in their charge to the foundation of an orphan asylum, or any other similar work not within the scope or the means of the local authorities, but to improvements which would not be effected with other means.

Model of Sebastopol.—A large plan, in relief, of Sebastopol is now being arranged in the gallery of the *Hôtel des Invalides* in Paris, where those of the fortified towns of France are placed. The plan in question is executed in plaster in twenty parts, and, when put together, will measure more than ten feet in length, and more than seven in width. It is on the scale of one in 2,000, and has been produced—from the lithographic plates attached to the journal of the operations of the French engineers, by Marshal Niel—by a sergeant of sappers, named Faure, of the Imperial guard, under the direction of Captain Riondel, who commanded a company of that division. It will be eventually placed in a portion of the Palace of Versailles occupied by the engineers of the Imperial guard.

Soldiers' Gardens.—In the House of Commons on Monday night, Mr. W. Ewart asked the Under-Secretary of State for War whether he would state, or allow a return to be made, showing to what extent the cultivation of gardens by soldiers had been adopted in the army. The Marquis of Hartington said that a circular had lately been issued by the War-Office, giving greater facilities for the cultivation of gardens by the troops, and since then several applications had been received on the subject; but as there had not yet been time for many gardens to be placed under cultivation by soldiers, perhaps the hon. member would wait a month or two longer before moving for these returns, to the production of which there would be no objection.

Correspondence.

Town Gardens.—Sir,—The very pleasant paper of Mr. John Bell, on the subject of town gardening, recals to my mind an article I contributed to one of the early numbers of *Once a Week* on a similar subject; not on the actual gardening, but on the means of acquiring space for the garden by the substitution of flat roofs for pitched roofs, adapting the Eastern architecture of dry climates to our own moist climate by better mechanical appliances. Our pitched roofs, with steep slopes, are simply a result of our imperfect materials, and their incapacity for tight horizontal joints; were they made like ships' decks, and as carefully looked to, there would be no difficulty in keeping them tight horizontally. But even the steep pitch, though advantageous in giving a better water-shed, has its disadvantages in the greater difficulty of keeping the tiles or slates from falling down, and above all, in the interminable trouble of lead or other metal in gutters and ridges. But we have now a material thoroughly well adapted for flat roofing, and capable of water-tight joints, in sawn slate, which would, I incline to think, make, on the whole, a cheaper roof in first cost, and certainly a less costly and troublesome one in repairs, and without taking up space or elevation with a miserable "cock-loft;" a receptacle for soot, dust, and bad air through a series of years. The structure of this roof would be simple. Parallel wood beams, or beams of T-iron, of sufficient depth for the load, would stretch from front to back walls, or between the party walls, at the distance apart of the slates' widths, and overhanging the walls front and back some twelve inches, with a slope either way for water to run off into hanging gutters, communicating with vertical shoots. A light iron railing, breast high or more, should enclose this front and back and along the party-walls, separating one house from another. The openings for the chimneys and the roof door should be formed like ships' hatches, with combings round them, by vertical slate ledges of sufficient depth. The edges of the slates, where abutting against each other, should be grooved in curves, and filled in with hollow piping of gutta-percha or india-rubber, forming, not a plastic caulking like that of a ship, but an elastic caulking, keeping all tight under vibration or expansion and contraction. The slates should be kept together in both directions through the whole length and breadth by light iron rods or bars below them, turned up at the ends. The lower sides of the horizontal beams should be ceiled as usual, with provision for allowing currents of air to pass freely through in warm weather, and for keeping the air stationary in cold weather, thus preserving an even temperature. In this mode what are ordinarily garret rooms with sloping sides would be square, and another floor—an open-air floor would be added to the house. To this floor water could be carried up by pipes, with or without a cistern, and be allowed to run away, after being used for irrigating gardens, as freely as on the ground surface, without any fear of leakage within the dwelling. This flat roof could be covered with a green-house all over, or with a simple vertical shelter to the north, some six feet high, possibly with a folding shelter to the east; and supposing all the buildings to be of equal height, there would be no reason why vegetation should not be as perfect as on a hill side in the country, except as regarded smoke, for the human breath ascending from below would rather act as a manure to the vegetation there than as an evil, and the vegetable absorption would get rid of the nuisance. With regard to smoke, that will gradually lessen as knowledge looms on us by the fact that smoke is wasted fuel, and that its consumption is an economy. The probable solution for this evil will be in leading the smoke into heated combustion chambers, burning away the visible products, and we know not how far the invisible gases and the wasted draught heat may yet be economised or made applicable to the roof gardens. It is quite within the range of possibility, and far from improbable, that our unsightly London chimneys may yet become objects of great beauty by being clothed in ivy, Virginia-creeper, honeysuckle, jessamine, monthly-roses, and other hardy plants. Even now such things exist in many parts of the City where fresh air blows; and a sheltered wall, with a south or west aspect, in the City, might be as pleasant at Christmas as a sea beach under a southern chalk cliff, which makes an open-air green-house on a bright winter's day, with the thermometer at 15°. Any changes of this kind with existing dwellings must be limited, but it is worth the while of builders to study the question thoroughly for future erections, especially for the workmen's dwellings which will be in process of erection at railway termini. We can imagine a future time when, with smoke and sewage thoroughly utilised, and with house-tops covered with vegetation, this our London may become the healthiest, as well as the most beautiful, city in the world. We hear much of the beauty of Paris, but it is a beauty of the barrack kind—ornamental barracks; all done to autocratic order. The beauty of London will be that of individual growth—various and yet harmonious; varying, like every human face, and every vegetable leaf and branch; the great work of nature ever expanding, and not the work of the military pedagogue, cramping everything to a small set pattern like the wooden trees of a child's toy-box. Mr. Broome says that "air draughts are very damaging to plants," very probably giving vegetables cold. But the air cistern is a still worse thing. In the business house of Rothschild, in St. Swithin's-lane, there has been for some years an attempt to attain a fore-court garden, such as we see in Spain and France, but it is a very sickly affair, apparently from want of sun and ventilation. If the garden were removed to the top of the low range of offices, it would probably thrive and might have a three feet depth of earth. It would be a pleasant thing to see the great capitalist set this pattern to a wealthy city, only needing a good example to follow.—I am, &c., W. BRIDGES ADAMS.

MEETINGS FOR THE ENSUING WEEK.

MON. ...R. Geographical, 8½. 1. Mr. W. E. Hickson, "On the Climate of the North Pole." 2. Mr. C. R. Markham, "On the Best Route for North Polar Exploration."

TUES. ...Medical and Chirurgical, 8½.
Civil Engineers, 8. Captain H. W. Tyler, R.E., "On the Festiniog Railway for Passengers, as a two-feet guage, with sharp curves, and worked by Locomotive Engines."
Zoological, 8½.
Syro-Egyptian, 7½. Mr. B. H. Cowper, "Observations on Dr. Lee's Syriac MSS."
Photographic, 8.
Ethnological, 8. 1. Mr. J. Crawfurd, "On the Physical and Intellectual Characteristics of the African or Occidental Negro." 2. "On Human and Animal Remains from a Cavern near Drintion, Argyleshire." 3. Professor Busk, "On a Human Cranium from a Stone Coffin, at Phu Bodach, Bute," sent by the Rev. A. McLeod.

WED. ...Graphic, 8.
Literary Fund, 3.
R. Society of Literature, 8½.

PARLIAMENTARY PAPERS.

SESSIONAL PRINTED PAPERS.

Par. Numb.

Delivered on 16*th March*, 1865.

69. Bills—Justices of the Peace (Discretionary Powers).
73. ,, Metropolitan Main Drainage Extension.
3. (260 to 266). Railway and Canal, &c., Bills—Board of Trade Reports, Parts 260 to 266.
65 (IV). Committee of Selection—Fifth Report.
71. Gold Coast—Correspondence.
129. Metropolitan Houseless Poor Act (1864)—Returns.
122. Dockyard and Victualling Lighters—Returns.
130. Royal Charges—Royal Commission.

Delivered on 17*th March*, 1865.

69. Bills—Justices of the Peace Discretionary Powers (corrected Copy).
71. ,, Courts of Justices Concentration (Site) (Amended by Select Committee).
3 (267 to 271). Railway and Canal, &c., Bills—Board of Trade Reports, Parts 267 to 271.
90 (VI). Civil Service Estimates (1865-66)—Class VI.
121. Attornies, &c., Certificates—Return.
126. Civil Service Estimates (Votes "on Account.")
127. Pilotage—Order in Council.

Delivered on 18th and 20th March, 1865.

72. Bills—Mortgage Debentures (as amended by the Select Committee).
74. ,, Chelsea Bridge Toll Abolition.
76. ,, East India (Governor-General's Powers, &c.)
77. ,, East India High Courts.
3 (272 to 277, and 280). Railway and Canal, &c., Bills—Board of Trade Reports, Parts 272 to 277, and 280.
43. Revenue Departments—Accounts (corrected Copy.)
66. (iv). Railways and Canal Bills—Fifth Report of General Committee.
80. Local Taxation—Return.
111. Metropolitan Police (1864)—Accounts.
112. Chain Cable and Anchors' Act (1864)—Report.
124. Courts of Justice Concentration (Site) Bill—Minutes of Evidence.
131. Spirit Duties—Report.

Patents.

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From Commissioners of Patents Journal, March 31st.

Grants of Provisional Protection.

Agricultural implements—675—G. Wright.
Ammoniacal gas, motive power from—611—R. A. Brooman.
Atmospheric air, apparatus for cooling—636—L. Perkins.
Bags, mail and despatch—733—G. T. Bousfield.
Balls, cricket, &c.—696—C. Huntley.
Bales, hoops used in packing—663—W. J. Dorning.
Barley, machine for thrashing—793—B. J. Webber.
Blast furnaces, utilizing the waste gases of—478—J. Cliff.
Blast furnaces, hot air stoves for—666—J. Cliff.
Boxes, joints for—640—H. W. Wimshurst.
Boots, heels for—710—G. Evans.
Bricks, machine for the manufacture of—767—C. W. Spark, T. S. Cross, and W. Adkins.
Bridges, construction of—633—E. W. Young.
Burglary alarum—664—W. H. Hudson.
Button holes, machine for cutting—687—J. Garelly.
Carriages, venetian blinds for—676—T. Startin.
Carriages, disconnecting horses from—683—P. Marvaud.
Carriage ways—661—W. H. James.
Carding engines—593—J. M. Dunlop.
Charcoal, apparatus for cooling—730—J. F. Brinjes.
Cigars—595—C. L. Roberts.
Clay, preparing Kaolin or China—805—J. Wright.
Coals, &c., drying and sorting—715—F. H. Warlich.
Colour printing—721—I. Baggs.
Cotton, apparatus for dyeing—617—S. Akerord.
Cotton gins—673—E. Leigh.
Dental operations, apparatus to facilitate—706—W. D. Napier.
Drying apparatus—603—H. A. Bonneville.
Electric piles—723—W. Clark.
Explosive gases, indicating the presence of—668—G. F. Ansell.
Fabrics, manufacture of—801—W. Clarke.
Fabrics, mechanism for attaching buttons to—763—F. Wise.
Fencing, socket for—775—A. G. Browning.
Fire-arms, cartridges for breech-loading—708—F. A. Braendlin.
Fire-arms, revolving—659—W. Clark.
Fires, apparatus for blowing—755—J. Cookson and P. Billington.
Flax, machinery for preparing—680—J. Samuel and S. Millbourn.
Flax, apparatus for hackling—690—T. and H. W. Whitehead.
Flax, machinery for scutching—627—A. Potts.
Furnaces, &c.—692—E. B. Wilson.
Furnaces, puddling, &c.—700—J. Wright.
Gas burners—568—T. S. Hall.
Gas and water, connecting tubes for conveying—669—V. Delperdange.
Gas engines—731—H. Smith.
Gas burners—809—W. M. Baker.
Gasometers—781—C. H. Pennycook.
Glasses, wine, &c.—693—J. M. Napier.
Grain, apparatus for ascertaining the quality of—632—W. Bunger.
Hammers, steam—641—J. Dodge.
Hats, dyeing straw used in the manufacture of—463—E. Carchon.
Harrows, drags, &c.—739—J. Seaman.
Horses, shoes for—639—W. Clark.
Hydraulic engine, valves for—791—J. Smith and S. A. Chease.
Illuminating, vaporizing hydro-carbon for—717—G. T. Bousfield.
India rubber, cutting sheets of—656—B. Collins.
Iron safes—653—A. E. Taylor.
Iron doors—660—J. T. Harris.
Iron ships, coating the bottoms of—681—R. P. Roberts.
Iron bars, manufacture of puddled—777—R. T. Crawshay and I. A. Lewis.
Jewelry cases—803—J. J. Carter.
Keyless watches—726—H. Chevob.
Lamps—753—A. V. Newton.
Liquids, apparatus for drawing off—761—J. Walls.
Lime, hyposulphite of—765—J. C. Stevenson.
Machines, numbering—625—T. Craig and D. Carlaw.
Marine steam coilers—613—E. Humphreys.
Meat, method of preserving—645—A. C. Henderson.
Metal, engraving on—807—R. A. Brooman.
Metals, apparatus for treating—697—R. M. Roberts.
Metals, apparatus for rolling—701—R. Marsden.
Metallic bedsteads—699—J. Atkins.
Mining, apparatus for—737—J. Farrar and E. Booth.
Musical instruments—741—W. Brookes.
Nails, manufacture of—785—C. Farmer and T. Turner.
Noxious gases, traps to prevent—698—J. Bragg.
Oils, treating and purifying—732—C. Morfit.
Paper, machinery for manufacture of—581—J. Park.
Paper, machinery for manufacture of—533—J. H. Rawlins and J. Chappell.
Pipes, core employed in the casting of—587—D. Hartley.
Piston rods, packing for—647—F. Wise.
Piles, apparatus for driving—597—D. and J. Manwell.
Property, safes for securing—728—E. Loysel.
Pumps—751—J. Goodfellow.
Railway, permanent way of—386—J. and J. Porter.
Railway waggons, apparatus for coupling and uncoupling—609—D., J., and J. Morris.
Railway trains, communication between passengers and guard of—679—A. Westhead.
Safes—621—S. Phillips and J. Groves.
Safes, fire and burglar proof—695—John Tann.
Safes, &c., securing—702—H. Hill.
Sheet metal, cutting, punching, &c.—795—G. Farmer.
Shoes, manufacture of—637—A. E. A. Aubert and G. E. M. Gerard.
Smoke vents—724—T. Kennedy.
Smoking, tobacco for—615—W. E. Newton.
Steam blowers—3133—W. Brookes.
Steam generators—607—J. H. Johnson.
Steel, manufacture of—657—R. Mushet.
Steam generators—743—A. V. Newton.
Steam generating—771—J. T. Romminger.
Stones, apparatus for scouring—686—J. Hird and J. Walker.
Stockings, manufacture of—725—H. Owen.
Sugar, apparatus for refining—599—R. A. Brooman.
Surgical operations, instruments for—591—C. Rahn.
Switches, levers for railway—709—J. Deas.
Tanning, treating hides for—631—W. Clark.
Tee-piece and valve—684—C. Johnson.
Temperature, securing low and uniform—719—A. V. Newton.
Telegraphic instruments, apparatus for protecting—713—A. Bertsch.
Thieves and fire, safes for securing property from—714—E. D. Hodgson.
Toast racks—694—G. Carter.
Tubes, strengthening and ornamenting—667—E. Leahy.
Tyres, manufacture of railway wheel—665—W. D. Allen.
Vehicles, apparatus applied to—589—P. Rothwell.
Vessels, side propellers for—602—L. Thomas.
Vessel, registering the course steered by a—787—W. Arthur.
Walking sticks, apparatus for bending—682—J. and D. J. Jones.
War, ships of—509—G. Haseltine.
Water, apparatus for supplying measured quantities of—707—R. G. Rattray.
Weaving, looms for—583—S. Brooks.
Window sashes, bolts for—672—W. Smith.
Wrought iron, converting pig iron into—649—M. Morgans.

Invention with Complete Specification Filed.

Sewing machines—819—R. W. Morrell.

Patents Sealed.

2428. R. A. Brooman.
2438. T. T. Swinburne.
2441. A. Monro.
2456. F. Tolhausen.
2492. J. Webster.
2498. B. H. Jones.
3059. E. Myers.
3130. B. Dobson, W. Slater, and R. Halliwell.
3199. W. H. Maitland.

From Commissioners of Patents Journal, April 4th.

Patents Sealed.

2458. T. Turner, jun.
2481. H. S. Coleman and A. G. E. Morton.
2495. T. Lambert & H. C. Soper.
2500. W. Gilbert, E. Cooper, and G. R. Webster.
2568. S. Howard and W. Wood.
2574. C. Pettit.
2585. T. Turner, jun.
2627. S. S. Anderson.
2646. P. Dutrulle.
2792. M. W. Ruthven.
2793. E. J. W. Parnacott.
2800. W. Willis.
2940. L. Valant.
3241. P. C. P. L. Prefontaine.
156. S. F. Van Choate.
204. C. T. Wells.
209. W., R., J., and A. Woodward.
438. G. T. Bousfield.

Patents on which the Stamp Duty of £50 has been Paid.

863. W. A. Ashe.
891. W. Tyler.
889. R. Young.
897. R. C. Ransome.
913. H. Smith.
917. E. Hartley, G. Little, and J. Hinchcliffe.
946. D. Wilson and E. A. Cowper.
957. L. Lindley and F. Taylor.
1009. G. Hollinshed.
1283. H. F. Broadwood.
892. W. H. Hook.
959. G. Moulton.
896. R. Burley.
894. W. B. Lord and F. H. Gilbart.
907. C. P. Gontard.
914. J. H. Johnson.
1010. J. and J. Bullough.
930. B. Blackburn.

Patents on which the Stamp Duty of £100 has been Paid.

667. E. A. Jacquin.
686. J. Mercer.
692. A. Pelez.
694. A. P. Dadley & N. Brough.
710. J. Fowler, jun.
731. R. Hornsby.